



Soft Vertical Wrapper

between texture and form

RICE UNIVERSITY

Soft Vertical Wrapper

by

Sara de Amaral e Sousa Peres Jacinto

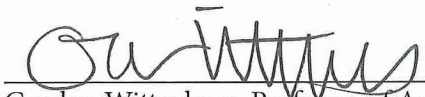
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ABSTRACT

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Soft Vertical Wrapper is a formal investigation which explores how loosening and softening a vertical building’s envelope may engage viewer perception. This engagement is produced by shifting expectations through displacement and deviation. The rigid, thin and specular envelope takes on the formal qualities of a smooth, thick and continuous soft wrapper, draping and drooping over a stable core, thus imbuing architecture with the appearance of a physical quality at odds with its reality of robust, lasting and structurally stable firmness. By maintaining the legibility of a clear formal precedent, the soft wrapper embodies a singular moment within an implied continuous transformation.

The geometrical analysis of draped and droopy is an essential part of this thesis as a method to reverse engineer a largely intuitive design process, and extract rules that could be used to reproduce this project in a different context.

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Engaging Softness

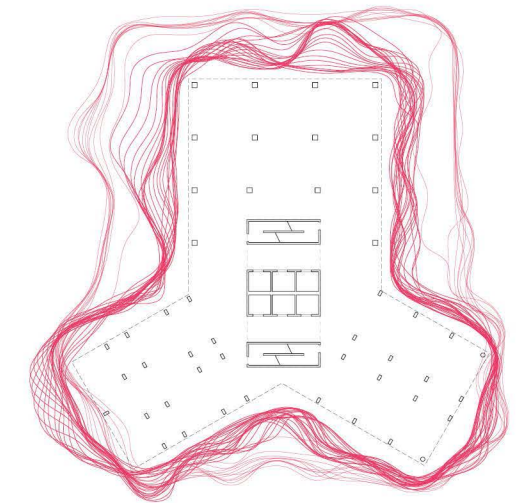
The relevance of the architect today has become a central question within the discipline. Once the omnipotent inventor of utopian life, the architect is increasingly called to act as an expert or consultant, one player in a vast and complex orchestra, with very limited scope. This new situation has been attributed to various causes: the rise of market economy¹, a radical change in the scale of building production², and relentless technological advancement³. Although different origins suggest different responses, rather than reclaiming complete control, the present thesis aims to explore the relevance of architecture in this context of restrained influence.

¹ In office buildings, core and shell developments have long separated the design of the envelope from that of the interior. One architect designs core and shell (or just shell) and each tenant becomes responsible for interior finishes, which generally happen later in time. Farshid Moussavi's 130 Fenchurch Street in London (currently under development) is a typical example. A more recent phenomenon is to have multiple architects engaged in one project at the same time, with divided and very specific responsibilities. The Bank of Panama Tower in Panama City (2012) is one example: Spanish architect Juan Herreros designed the façade while the interiors were planned by local architects Mallol y Mallol.

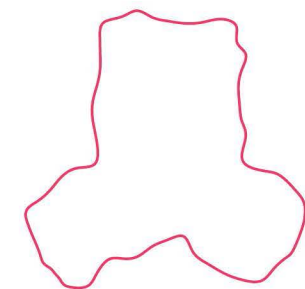
A similar strategy is now being extended to residential and hotel developments. 215 Chrystie St in New York and the new Conrad hotel in Washington DC's City Center, both designed by Herzog & De Meuron and currently under development, count a team of three separate offices to complete the scope that would usually be the responsibility of a single one. In both cases the architect has been replaced by a team: design consultant, architect of record and interior designer.⁴

Globalization has made these forms of practice more common and widespread. Although total control over design is disappearing, the envelope remains a privileged site for the articulation of a contemporary architectural project. In "The Politics of the Envelope" (2008), Alejandro Zaera Polo argues that the envelope is the most politically charged element of architecture; it is the most public feature of a building, open to all, and it embodies, in physical form the separation between public and private, outside and inside, weather and climate control.⁵ The author categorizes building envelopes in relation to proportion and fit: flat horizontal envelopes are loose (malls, airports, etc.), spherical envelopes have a relaxed fit (theaters, libraries, etc.), flat vertical envelopes are tight, and vertical envelopes are the tightest: slim fit. Fit describes the relationship between envelope and interior. A loose fit means the envelope is more independent

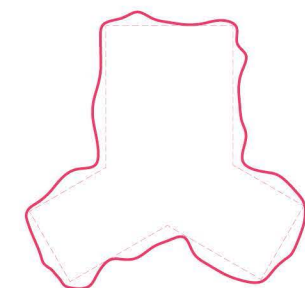
- ¹ In the provocative exhibition *Cronocaos* (Venice 2010), curated by Rem Koolhaas and OMA/AMO, one panel shows covers of *Time Magazine* featuring architects between 1930 and 1979. The images are organized in columns, by decade: three covers for each the 1930s and 1950s, two for 1940s, four for 1960s and one for the 1970s. The caption reads: "The rise of the market economy has meant the end of the architect as a credible public figure. Since Philip Johnson in 1979, no architect has appeared on the cover of *TIME* magazine. Starchitects accepted a Faustian bargain where they became more prominent, but their role less significant ..." Koolhaas, Rem. *Cronocaos*. The New Museum, New York, NY. May 7 - June 5, 2011.
- ² Albert Pope has often argued that the dramatic increase in scale of modern and contemporary urban development has led to a disconnect between architects and the production of urban space. In "Deep Structure", for example he writes: "The failure of the American housing tract or the European and Asian housing estate has led many [architects](...) to believe that design activity must be limited to the small-scale, sensorial context of bodies in space." Pope, Albert. "Deep Structure and Contemporary Urban Form". *Plat 4.0* (2014): 22-33. Print.
- ³ In a lecture at Rice School of architecture in 2015, entitled "New Models for a Global Practice", Juan Herreros's discussed the challenges of practice when it is no longer possible for the architect to control the increasingly complex technical aspects of building. Herreros, Juan. "New Models for a Global Practice", Lecture and public discussion at Rice University School of Architecture. November 11 and 12, 2015.
- ⁴ For 215 Chrystie Street, under development since 2012, Herzog & De Meuron serve as design consultant, Beyer Blinder Belle are the architect of record, responsible for coordination, documentation, and technical and regulatory compliance, and John Pawson is interior designer for the residential apartments. For the new Conrad Hotel in Washington DC's City Center district, Herzog & De Meuron is design consultant, HKS Architects, from Dallas, TX are architect of record, and Rottet Studio is the interior designer. Herzog & De Meuron. "Complete Works". 2016. Web. 1 Mar. 2016. <<http://www.herzogdemeuron.com/index/projects/complete-works.html>>
- ⁵ Zaera Polo, Alejandro. "The Politics Of The Envelope: A Political Critique Of Materialism." *Volume (Amsterdam, Netherlands)* 17 (2008): 76-105. Print.



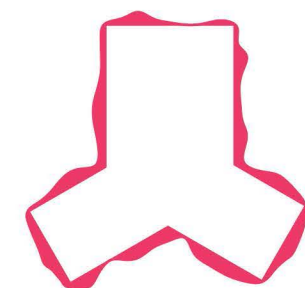
De-Stabilized rigid core



Whole



Parts with shared identity



Interstitial space

Figure 1. Plan Diagrams

both formally and programmatically from what is inside.

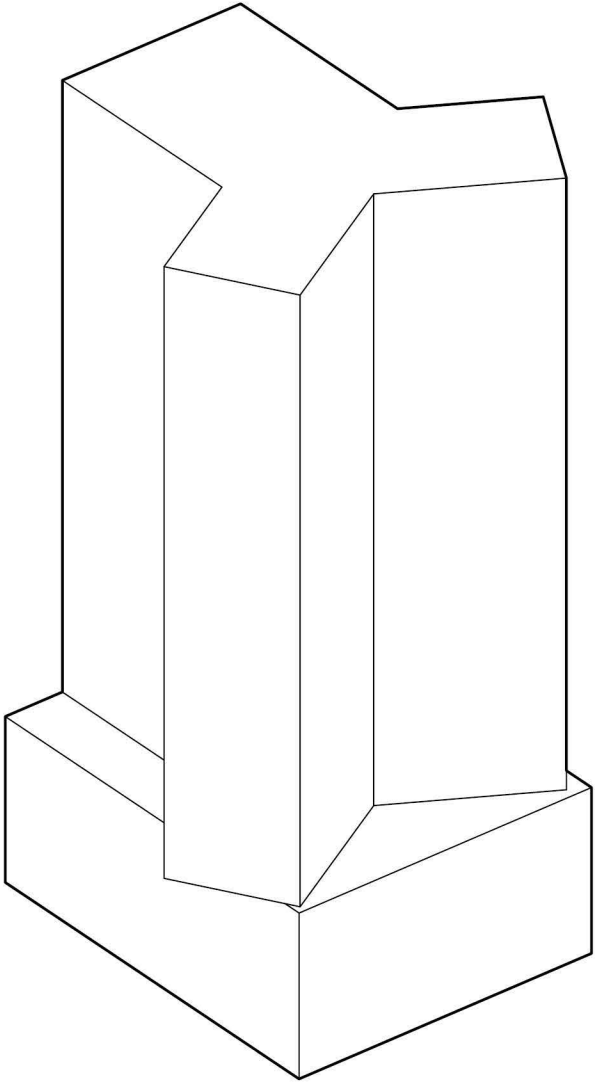
The vertical envelope, according to Zaera Polo, is the one where the pressure between expression and performance (technical, environmental and economic) is strongest.

Furthermore, as the author points out, iconic vertical buildings have a unique resonance with the public at large, being nicknamed sometimes as they emerge. “The Gherkin (Foster’s 30 St. Mary Axe), The Shard (Renzo Piano’s tower in London Bridge), Helter-Skelter (Kohn Pederson Fox’s Bishopsgate Tower), and Walkie-Talkie (Raphael Vignoly’s design for a tower on Fenchurch Street)” are some examples.⁶

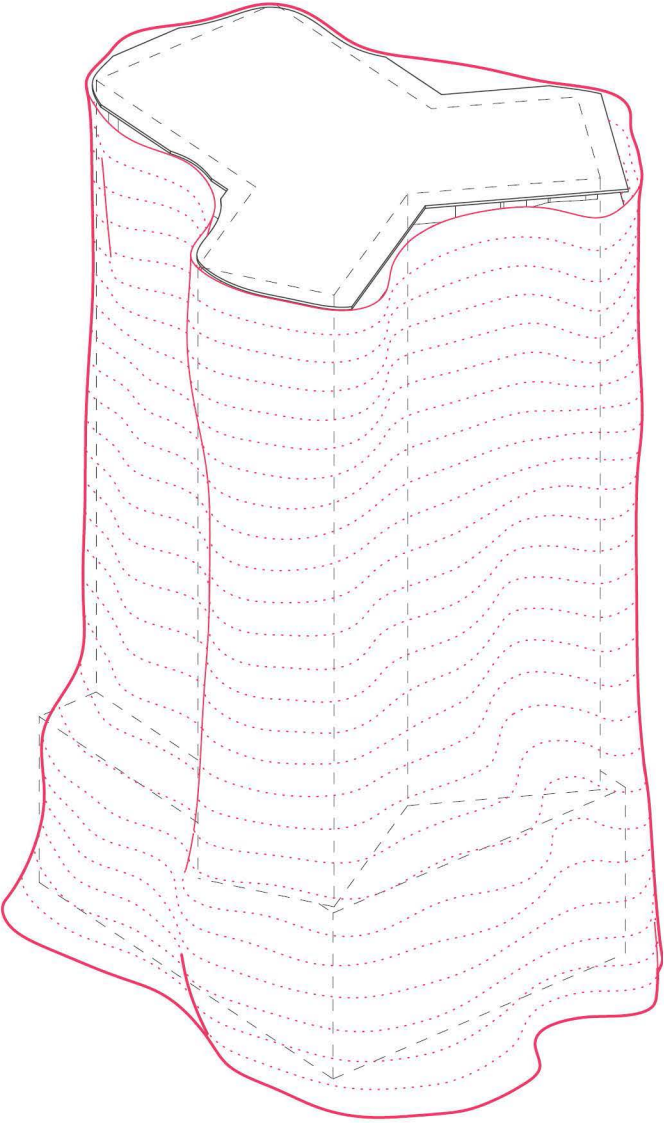
Loosening and softening the vertical envelope pushes against the hard logics that produce vertical buildings – repetition, efficiency and economy, – reclaiming and expanding the possibility of independent formal expression.

A looser envelope may also generate an interstitial space between inside and outside, blurring the hard separation that we have grown accustomed to of air-conditioned, completely insulated interiors. The work of architects Lacaton & Vassal has been crucial in this regard. Their use of inexpensive polycarbonate to create inhabitable intermediate zones within their projects has been instrumental for the development of the Soft Vertical Wrapper.⁷ While Lacaton & Vassal conceive this thick skin as a simple offset, maintaining the geometry of the inner core, the Soft Vertical Wrapper is formally soft, undermining the appearance of solidity and stability of its core.

6 *ibid.*
7 The transformation of Bois-le-Prêtre Tower in Paris, completed in 2011, the Latapie House in Floirac (1993), and the Management Sciences University Building in Bordeaux (2006) are three examples, that demonstrate the potential of intersitial space at different scales and for different programs.



Clear Volume
Whole made of parts



Soft Wrapper - Softened Edges
Single identity reinforced

Figure 2. Volumetric diagrams. (a) Core Volume. (b) Wrapped Core Volume

Softness is transient and unstable. These qualities resonate with our mediated lives, where unprecedented physical comfort and protection (especially in the western world) are constantly paired with unstoppable streams of continually changing information, broadcast in the myriad screens that surround us. Softness may also elicit an emotional reaction; it may be comforting (as in a pillow), or disgusting (as in rotten fruit). However, instead of symbolic representation or affect, the current project deploys softness for its ability to engage perception, possibly captivating the subject’s awareness.

This engagement is produced through displacement and deviation. In “Strong Form, Weak Form” (1991), Peter Eisenman argues that our mediated world calls for a displacement of the “conditions of architecture as defined by Vitruvius”:

“... yes, a building has to function but it does not have to look like it functions, Yes, a building has to stand up but it does not have to look like it stands up. And when it does not look like it stands up, or it does not look like it functions, then it functions and stands differently.”⁸

For Eisenman an architecture thus described has the ability to escape its servile and accommodating condition to become a provocative discipline, capable of challenging habitual expectations. The soft wrapper works in a similar way, imbuing architecture with the appearance of a physical quality at odds with its reality of robust, lasting and structurally stable firmness. This

effect is further enhanced by the use of a rigid material, in a sort of double displacement, where the qualities of smooth, thick and continuous softness are achieved through the manipulation of a rigid, diaphanous and specular material.

Unlike Eisenman’s Weak Form, the Soft Wrapper retains traces of an antecedent, producing a deviation from an original state without completely erasing it. This deviation plays an important role in engaging perception by containing in itself evidence of a familiar (and habitual) index, transformed over time. In Mike Kelley’s *Lumpenprole* (1991) a “large blanket [is] stretched across the floor” over a series of “unidentifiable objects” of varying shape and size.⁹ Although the objects remain incomprehensible the accidents they create on the surface of the blanket formalize a transformation away from the expected flat position. At the same time, there is a sense of failed concealment, as if someone had honestly attempted to make these objects invisible, leaving the viewer engaged in an impossible attempt to decipher this artificial landscape. Another example can be read in the well-known drawings of *The Little Prince*, “serpent digesting an elephant”, by Antoine de Saint-Exupéry, where understanding the antecedent completely changes what one sees (figures 4 and 5).¹⁰ Initially, the first drawing looks like a hat. However, after seeing a cross section (second drawing), details that were

easily ignored or tolerated at first – the little dot that represents the serpent’s eye and the asymmetry of the brim – become strong confirmations of the new reading, reinforcing the antecedent (serpent with empty stomach).

In both examples the wrapper significantly reduces the level of detail of the inner object, producing a low-definition version and reinforcing the whole (the blanket becomes a landscape, the serpent and the elephant become a figure (hat or not)). By blurring the edges of a stable and recognizable volume, the soft wrapper reinforces a single identity. This may be useful for contemporary complex institutions who might want to express one identity across several parts. However, the larger motivation of the soft wrapper is to engage the subject’s awareness by generating a new form that relates to something known, but not immediately revealed.

The following chapter describes the specific site and program chosen to investigate the thesis. The third chapter defines the formal qualities of draped and droopy, and its relationship to antecedent. Although materiality is not focus of the thesis, the fourth chapter outlines the parameters and intentions of a prospective investigation. In chapter five, draped and droopy’s geometry is analyzed and codified, so that its seemingly accidental form can be produced by the same efficient logics that create the repetitive and monotonous core, and reproduced in a different context.



Figure 3. Mike Kelley, *Lumpenprole*, 1991

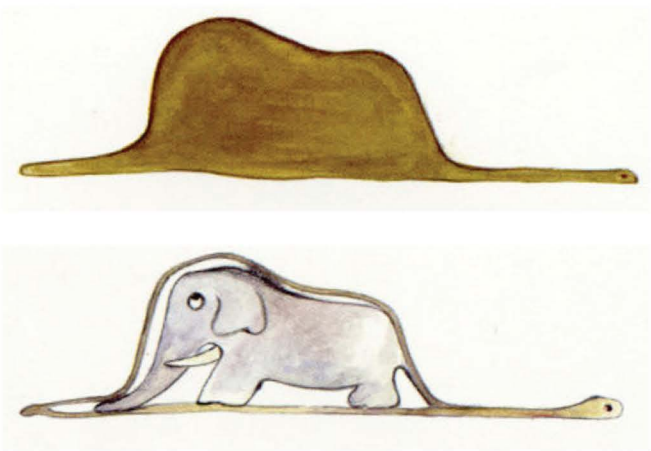


Figure 4 and 5. Serpent digesting an elephant, in *The Little Prince* by Antoine de Saint-Exupéry

8 Eisenman, Peter. “Strong Form Weak Form”. *Re-working Eisenman*. London: Academy Editions, 1993. 38-39.
9 Meyer-Hermann, Eva, et al. *Mike Kelley*. [Amsterdam]: Stedelijk Museum, 2013. Print, 156.
10 Saint-Exupéry, Antoine de. *Le Petit Prince*. [Paris]: Gallimard, 1993

Field and Core

Site and program are inherent elements of an architecture project, capable of fostering or hindering its ambitions. The definition of an adequate context within which the intentions set forth in the previous chapter can be further investigated is the subject of the present chapter.

The Vertical Soft Wrapper doesn't want to be alone; its softness is best understood in relation to hard vertical volumes. Rather than situating the project in the unusual context of high-density high rises as found in mid-town Manhattan or Hong Kong, where partial views control the experience of a building, downtown Houston offers a more productive setting. Even though the street grid defines a dense, nineteenth century urban space, its incomplete state of development recalls the more open modern urban space: a field of scattered towers interspersed with empty lots that allow for multiple viewing angles. The chosen site is at the southwest edge of downtown, adjacent to an elevated highway (north of site), which allows the building to be experienced in a succession of towers at high speed. To the south is midtown, a less dense, partially developed area that continues downtown's street grid and, to the west is Montrose, a neighborhood of single family houses with a tighter street grid running obliquely to downtown's grid. This transitional position, between different urban settings, allows the Soft Wrapper

to play a role at the urban scale, adapting its form to respond to local conditions. Wider and deeper corrugations face the less dense districts, emphasizing the intermediate scale and animating the most pedestrian zones of the site, while shallower undulation reinforces the overall massing of the building when seen from downtown and the elevated highway.

In section, the transitional quality of the site allows the Vertical Soft Wrapper to be both tall (if compared to Midtown or Montrose) and short (in relation to the taller high-rises of Downtown). This is important because the Soft Wrapper does not need to be the tallest to stand out; its formal qualities are the main distinguishing feature.

Finally, Houston requires one useful additional ingredient: parking. Parking becomes one of the parts of the building that the Soft Wrapper needs to negotiate, which has very different volumetric requirements from typical vertical programs.

Since the Vertical Soft Wrapper is mainly a formal investigation, the content was chosen to be the most banal. Offices, hotels and residential apartments are by far the most typical programs of contemporary (and modern) high-rises. The logics of mass production dictate the serial repetition of structure and layout from floor to floor. More recently, mixed use buildings which combine two or all three mentioned programs, have allowed developers to diversify their offer and



Figure 6. Site plan adjacent to Houston's downtown

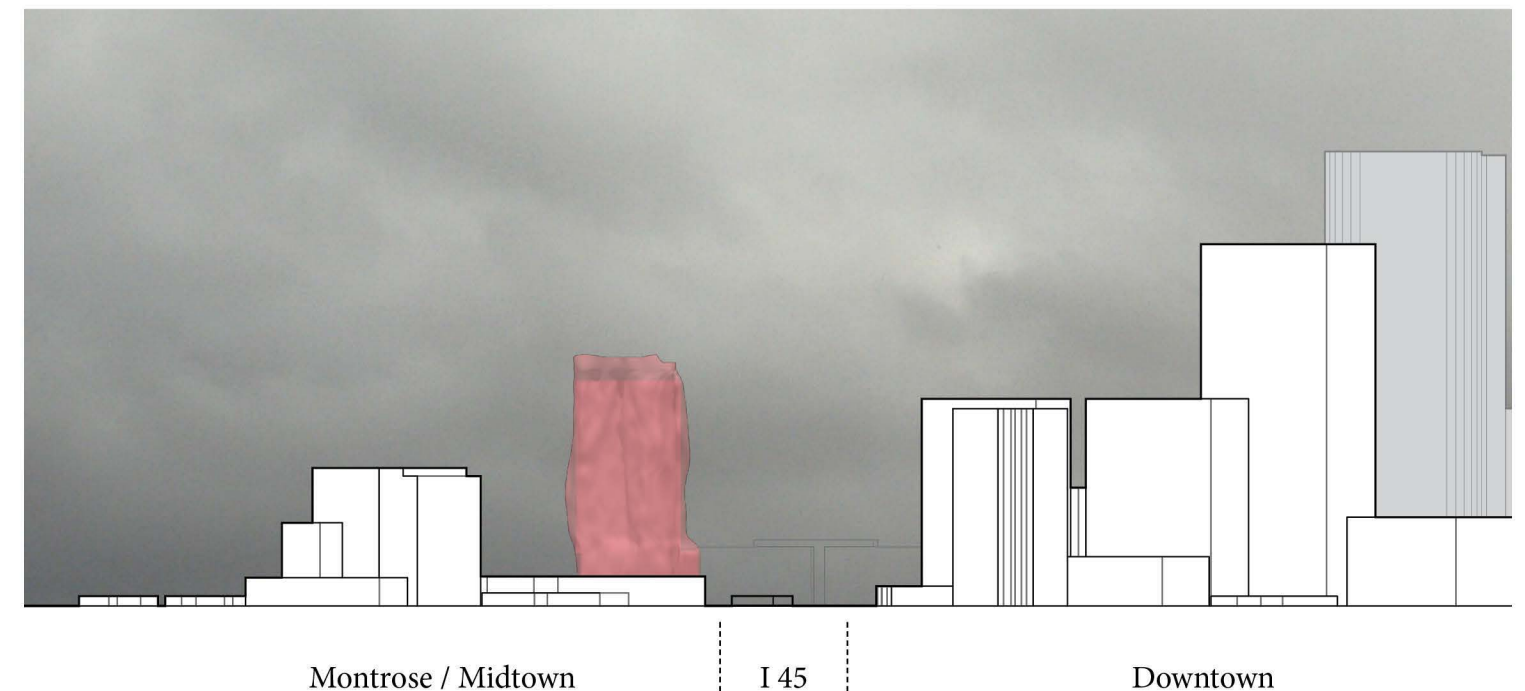


Figure 7. Site Section

hedge their bets against fluctuating office lease and residential market values. Furthermore, current local regulations allow for a reduction of the total number of parking spaces to be provided since the different uses will require parking at different times (office mainly during the day on weekdays, apartments mostly at night and weekend).

For the present thesis, however, the different programs are valuable because they all need daylight, imposing specific performance requirements on the envelope. Moreover their differences can be expressed on volume and envelope - different depth, different structural spans, different room sizes, etc. These variations can be negotiated by the Soft Wrapper.

There have been incredible investigations of loose wrappers over the last thirty years. Very often these projects housed activities that allow a high degree of independence between program and envelope. Jean Nouvel's Tokyo Opera House competition entry of 1987, Eric Miralles and Benedeta Tagliabue's (EMBT) Santa Caterina Market renovation (1997-2005) in Barcelona, Spain, and Frank Gehry's Disney Hall in Los Angeles (completed in 2003), are three examples.¹¹ The ambition of the Soft Vertical Wrapper is to be looser than typical vertical envelopes but remain engaged with program.

The three main functions (office, hotel and apartments) were thus laid adjacent to each other, in a "Y" plan where each arm contains a different program. See figures 11 and 12. Although the most common configuration for mixed use buildings is stacking (one program on top of another). The chosen layout promotes variation of the envelope at every



Figure 8. Jean Nouvel, Tokyo Opera House, 1987 (competition)



Figure 9. EMBT, Santa Caterina Market Renovation, Barcelona, Spain, 2005



Figure 10. Frank Gehry, Disney Hall, Los Angeles, California, 2003

11 According to Zaera-Polo's classification these are flat-horizontal (EMBT) and spherical envelopes (Nouvel and Gehry).

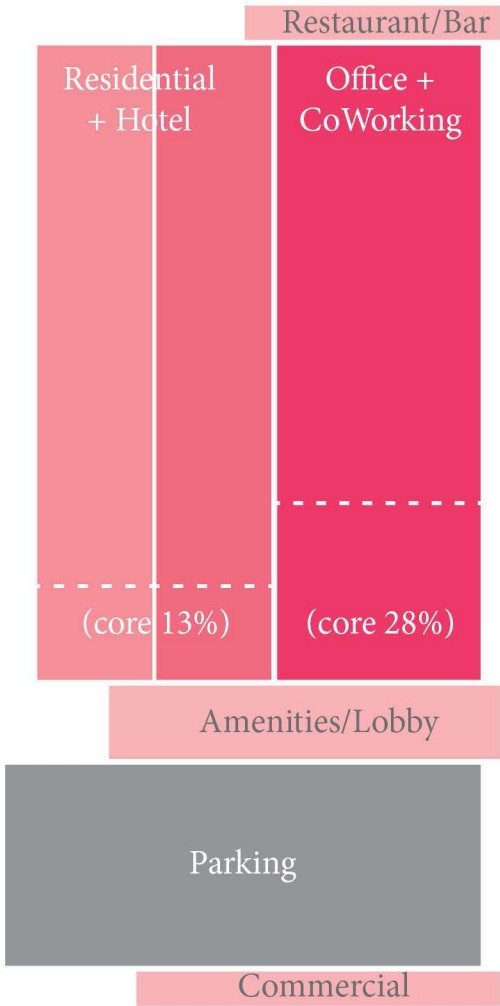


Figure 11. Program Distribution Diagram

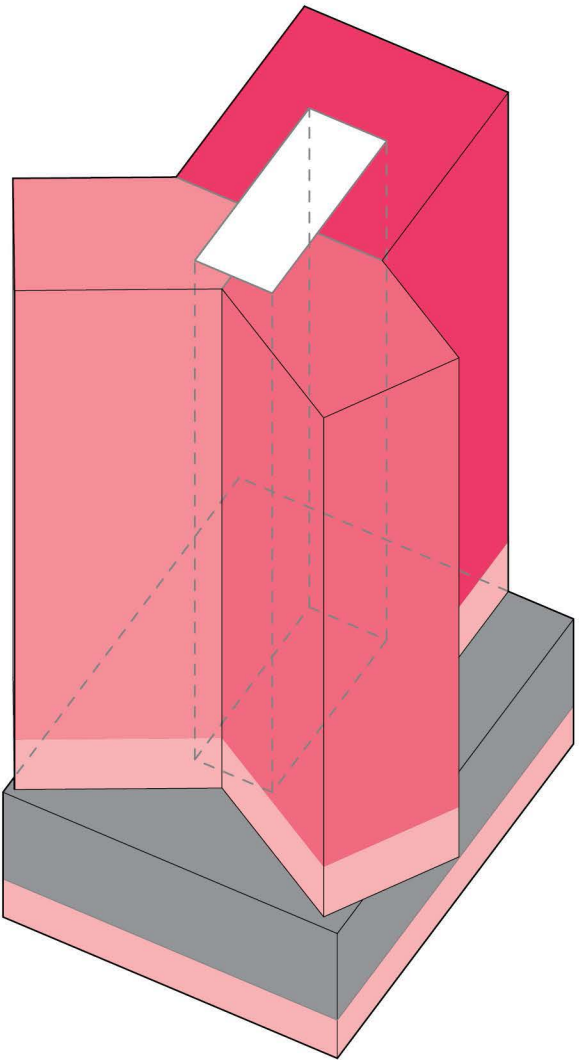


Figure 12. Color-coded axonometric drawing

floor and ensures that at least two of these programs are visible from any given point. The office ‘arm’ is wider than the others, reflecting less stringent lighting requirements of this typology. A shared vertical core (with stairs and elevators) occupies the center of the “Y”.

Parking requires deep floor plates for ramps and circulation, making it impossible to fit within the footprint of the tower. Instead it became a chunky base for the narrower tower above, producing an additional difference to be negotiated by the wrapper.

In addition to these four, strongly repetitive, main parts (office, hotel, apartments and parking), secondary, exceptional functions are located at transitional moments. At the ground floor, retail and entry lobbies mark the transition with the ground, providing activities that can serve the city at large; between the parking garage and the “Y” volume, on the eighth floor, are typical hotel amenities (restaurant, lounge, gym, admin offices, etc.); and, on the 30th floor a rooftop bar/restaurant.

Program and site, as described above provide the basis for the definition of the core, a 30-storey tower, composed of a bulky, six floor tall parking garage, with retail at ground level and a more slender trident-shaped top. The following chapter details the formal development of the Vertical Soft Wrapper.

Residential + Hotel	150,000
Core (13%)	19,500
Units	130,500
Office + CoWorking	120,000
Core (28%)	33,600
Open Space	70% 60,480
Private offices	15% 12,960
Group office (~5people)	10% 8,640
Meeting rooms	5% 4,320
Amenities/Services	47,000
Core/vertical circulation	6,360
L1 Retail	7,000
Coffee/Bar	2,120
Office Lobby	1,380
Hotel/Apartment Lobby	1,470
Back of House	3,370
L8 Administration/Back of House	3,420
Restaurant	1,850
Guest areas: Lounge, Reception, etc.	3,900
Gym	1,000
Screening Room	600
Outdoor Terrace	1,830
L30 Roof Deck	12,700
Parking	112,000
TOTAL (sqft)	429,000

Table 1. Program

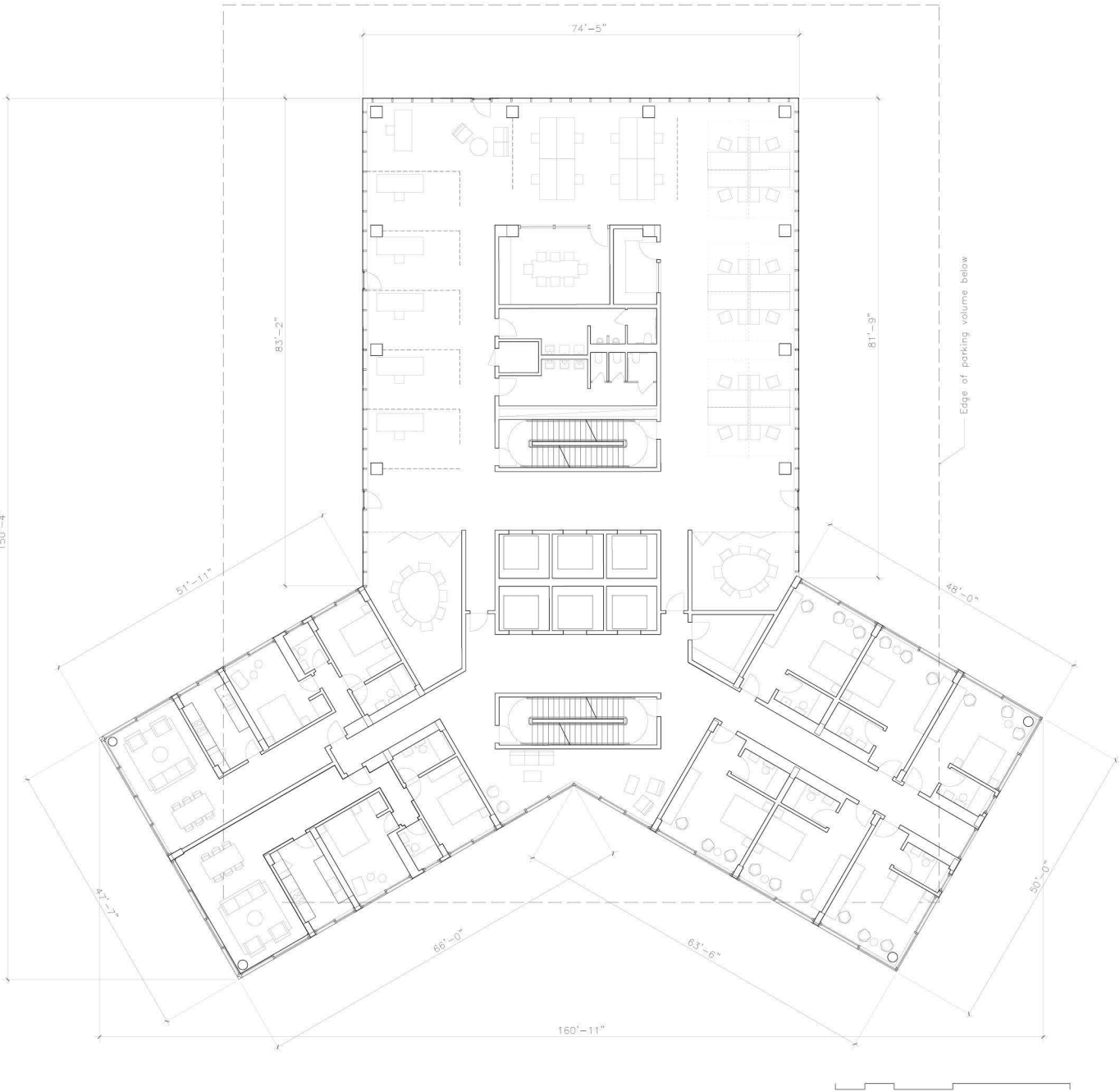


Figure 13. Typical floor plan for floors 9-29.

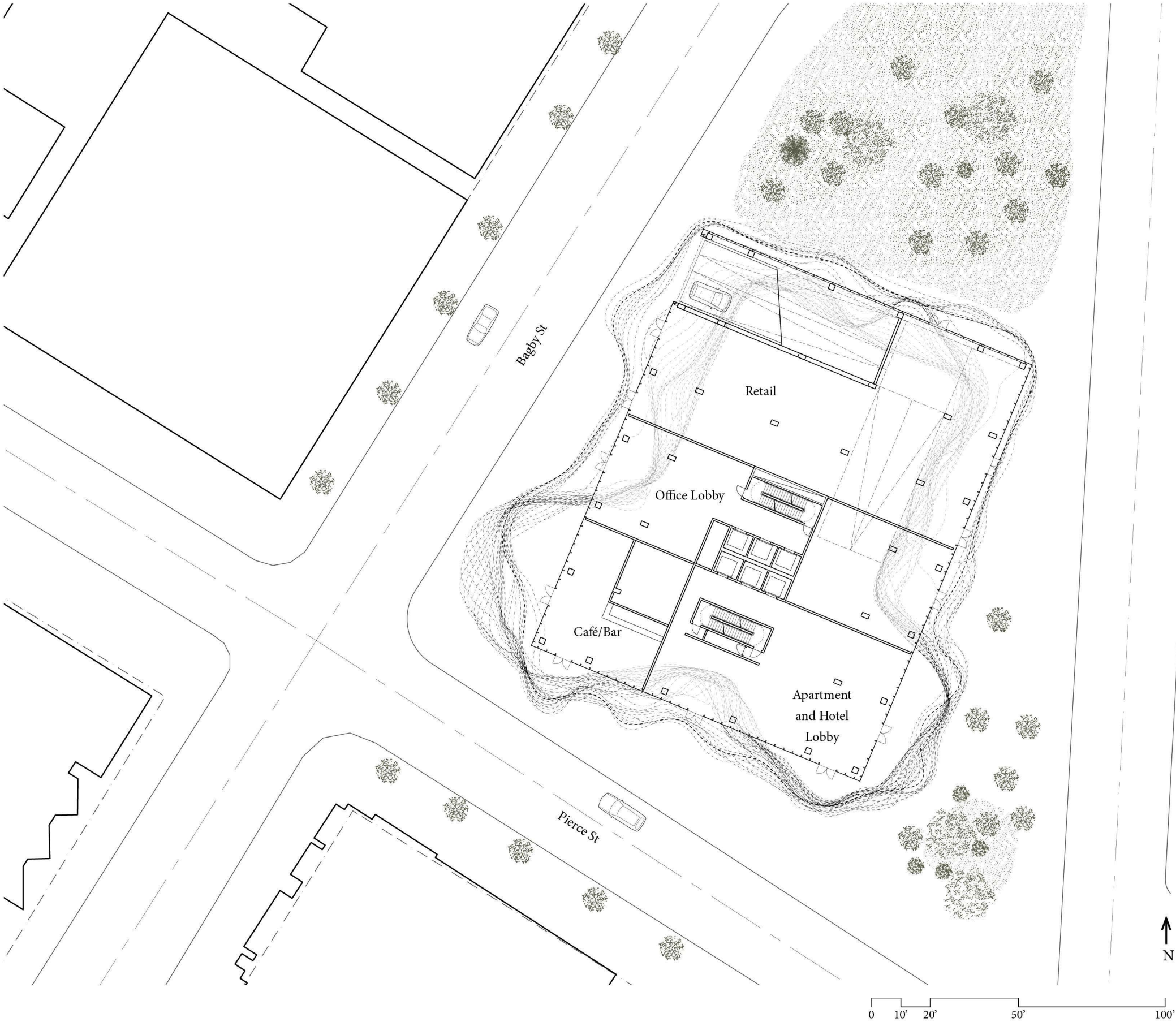


Figure 14. Gian Lorenzo Bernini,
Church of Sant'Andrea al Quirinale,
1658-1670



Figure 15. Francesco Borromini,
San Carlo alle Quattro Fontane,
1638-1641

> Figure 16. Site Plan
The soft wrapper's undulation is more pronounced at the main entrances on Pierce and Bagby streets, and more shallow along the remaining façades,



Soft Vertical Wrapper

Draped and Droopy

Initial formal studies, illustrated in figure 17, confirmed that wrappers can fundamentally alter our perception of what is inside from total concealment to textured effect. In doing so, they also impart particular formal and material qualities of their own onto the wrapped object. Working with different materials over a single volume is an expedient way to produce complex and varied geometries with specific formal qualities and limits regarding adherence to substrate. Looser wrappers, on the left, are formally more independent from the core than the tighter wrappers, on the right, which lend their texture to the inner volume.

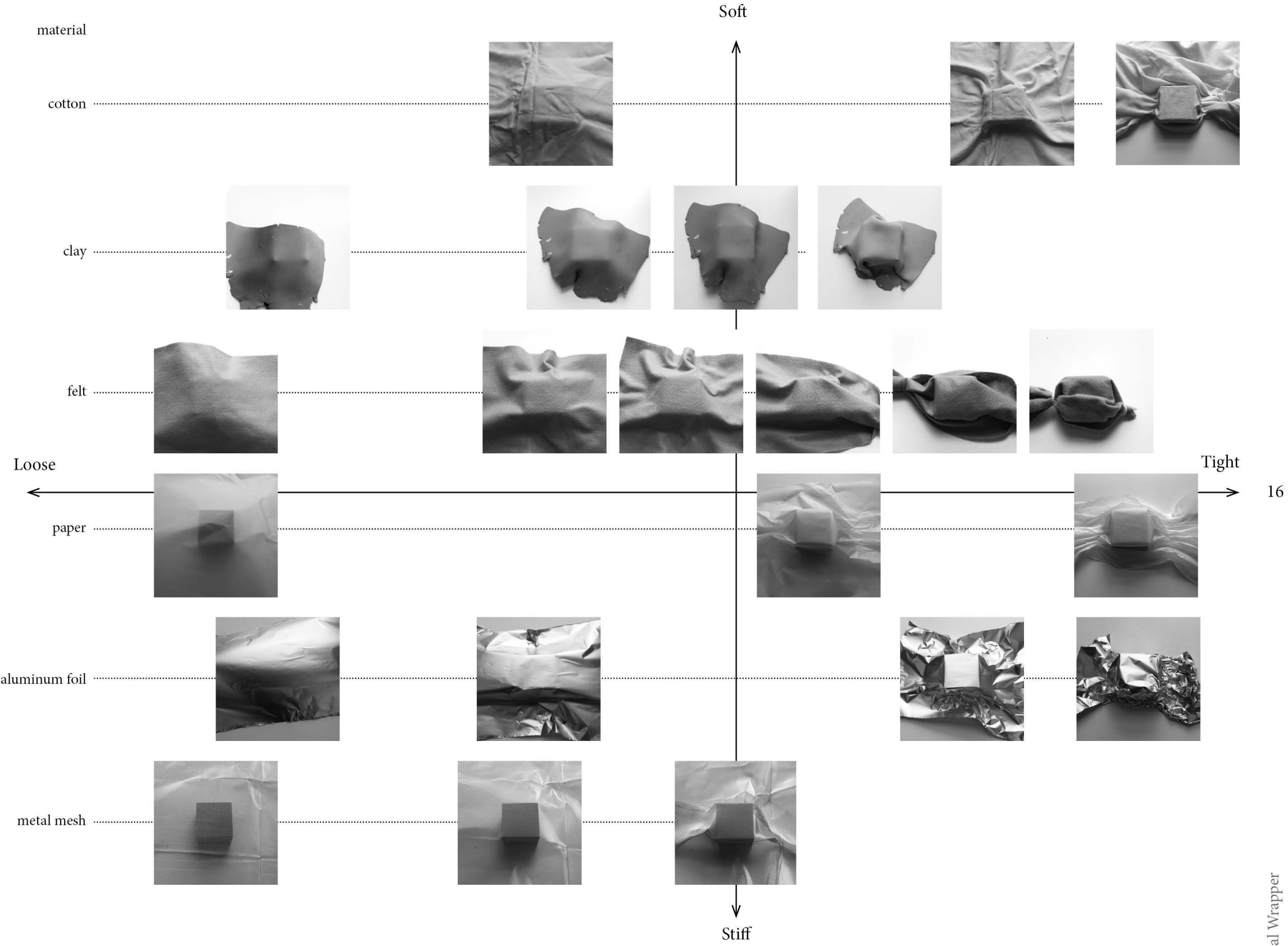


Figure17. Initial Wrapper Studies. Each row represents a different wrapping material ordered from soft at the top (cotton) to stiff at the bottom (metal mesh) and from loose on the left to tight. on the right. The left-most image in each row was produced solely by gravity: the wrapping material was dropped from a constant height (16 in) onto a rigid cube. Tighter fits were produced through direct manipulation of the wrapping material.

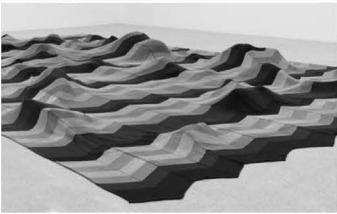
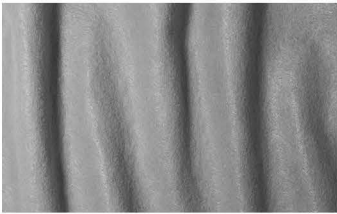
Texture and form are usually treated as separate conditions. The former is associated with surface and its micro-scaled articulation while the latter refers to volume and its overall large-scale articulation. However, these two categories can blend into each other. Three recent projects help illustrate this argument: Frank Gehry’s 8 Spruce Street Tower in New York, New York, completed in 2010, Studio Gang’s Aqua Tower in Chicago, completed in 2010 and Morphosis Phare tower in Paris, 2006-2010 (unbuilt).

In the first project, the geometry of the façade is similar to that of a wet-draped sculpture: it clings tightly to the substrate, revealing an antecedent (in this case a ‘T’ shaped plan). This reading is reinforced by vertical and continuous corners. The façade of the Aqua Tower, is slightly looser than in the previous example. Even though the corners are rounded and softened, the scale of undulation does not challenge the overall box, which is easily identifiable. In the Phare Tower, by contrast, the soft quality of the wrapper cannot be read in relationship to a rigid and stable index. Although the wrapper reads as an independent component – especially because of the fraying at the top and the lifting at the bottom –, there is little tension between it and the interior: a perfect fit.

These projects suggest a limit between texture and form, between the first two projects and the third, where texture is scaled up to the point where it takes over the whole to become form. The investigation of the present thesis is motivated by a desire to push the softening of the antecedent to the limit of recognition without losing contact. Keeping the reading of the antecedent retains the connection to something known and recognizable, thereby preserving a certain familiarity.



Winged Victory of Samothrace, c. 200-190 B.C.



Mike Kelley, Lumpenprole, 1991



Fishnet tights



Frank Gehry, 8 Spruce St, New York, NY. Completed 2010



Studio Gang, Aqua Tower, Chicago, IL. Completed 2010



Vertical Soft Wrapper



Morphosis, Phare Tower, Paris, France. Design 2006 - 2010

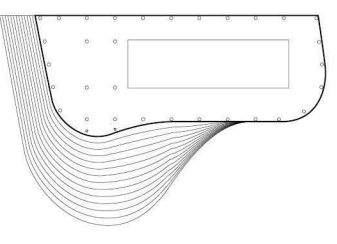
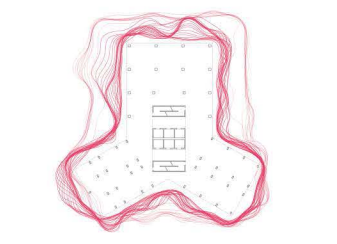
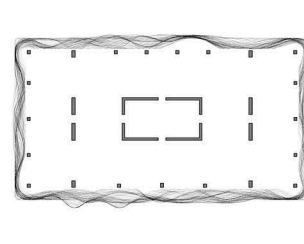
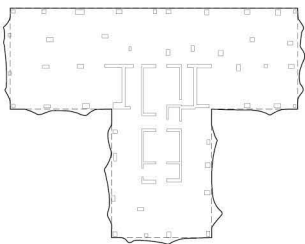




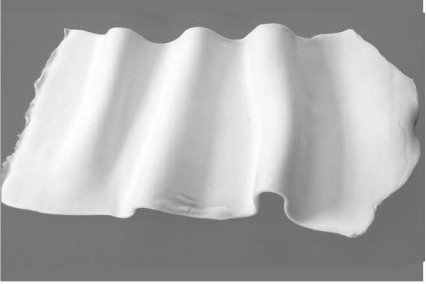




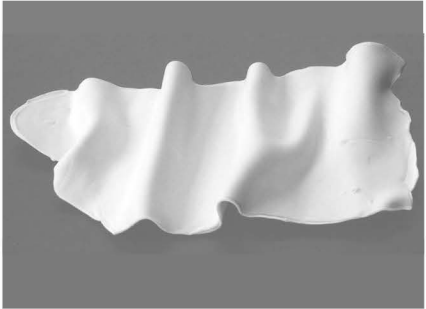
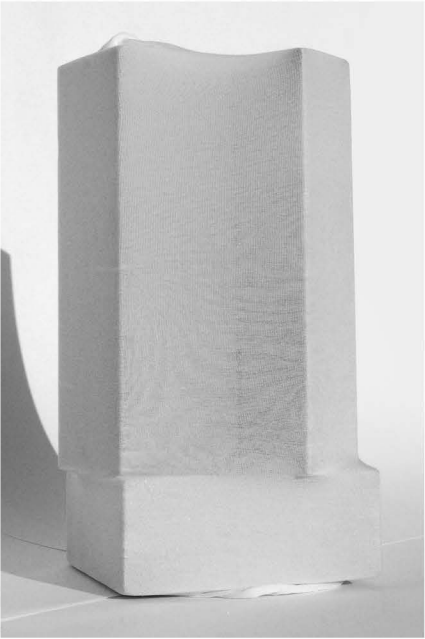






Figure 18. Between texture and form. The Soft Vertical Wrapper pushes the legibility of an antecedent to the edge of recognition, exploring the limit between texture (a small-scale effect) and form (large-scale articulation).

Indexical softness is perceived in relation to an antecedent that is not soft. In the examples on the right, softness is a formal quality of the wrapper. In the case of Wet-draped, for example, the soft quality of the wrapper is perceived through geometrical form, even though the material itself is not soft (marble in Guiseppe Sanmartino's Cristo Velato and formed stainless steel in Frank Ghery's 8 Spruce Street Tower).

The transformation of an antecedent – through stretching, stuffing, wet-draping – is consistent across these examples. Nevertheless, each action produces specific formal qualities. Stretched is taught, in tension. It reveals the outer edges sharply and conceals inner corners. It ignores gravity, reacting only to the wrapped parts. Stuffed is like stretched but with a non-elastic material.

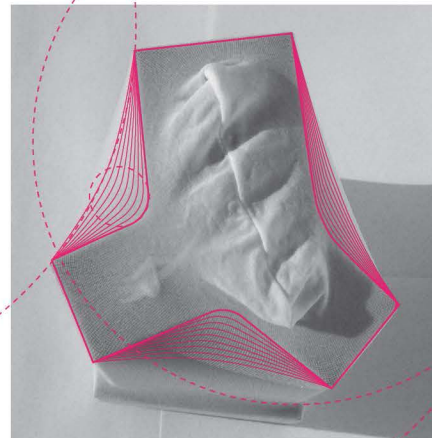
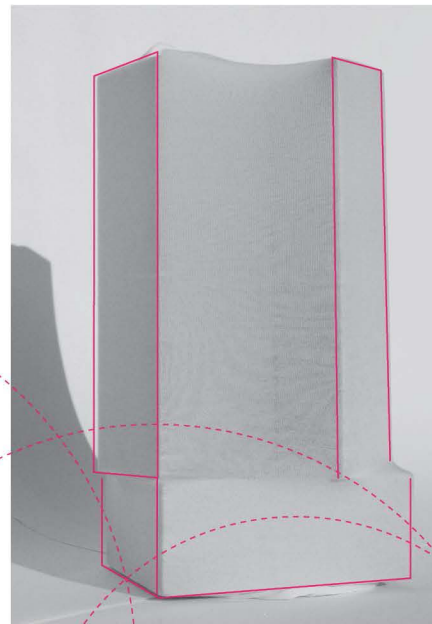
Figure 19-1. Forms of indexical softness. Stretching, stuffing, wet-draping and draping are four material operations that imply a soft, pliant wrapper. Their formal qualities can be traced in art and architecture and easily reproduced in physical models. A Draped and Droopy wrapped reveals less than a wet-draped one, more than a draped one and retains a relationship to gravity.

Stretched	Stuffed	Wet-Draped	Draped	Draped and Droopy
				
Herzog & De Meuron, Set Design for Tristan und Isolde, 2005-2006	Stuffed potato bag	Giuseppe Sanmartino, Cristo Velato, Naples, 1753	Leonardo DaVinci, Drapery Study for Seated figure, c. 1470	Model Magic study model F1
				
SoIl, Kukje Gallery, Seoul, Korea, 2012	Jean Nouvel, Tokyo Opera House, 1986	Frank Gehry, 8 Spruce St, NYC, 2010	EMBT, Sta Caterina Market Renovation, Barcelona, 2005	Model Magic study model F2
				
Y-S1 Elastic Stretch	Y-S2 Stuffed	Y-WD1 Wet-Draped	Y-D1 Draped	Y-DD1

It reveals some edges sharply but becomes loose at volume transitions. It acknowledges gravity in a very faint way. Both stretched and stuffed are problematic to the current project in that the large deviation from inner corners significantly increases volume depth, compromising the program.

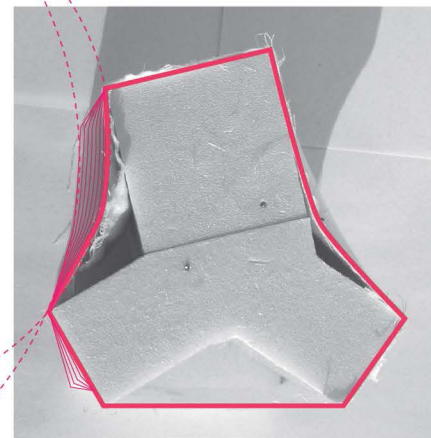
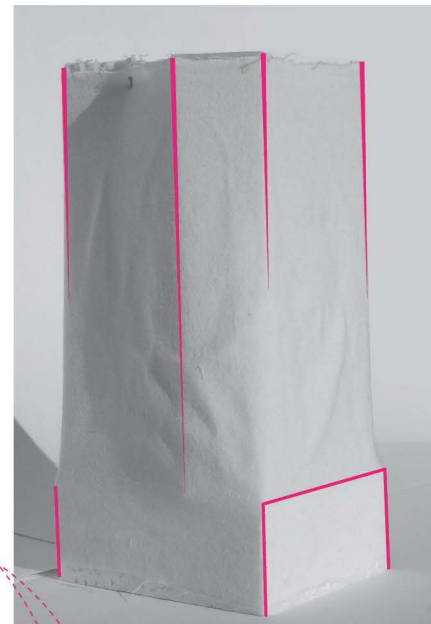
Wet-Draped clings tightly to the substrate, creating identifiable, continuous protrusions that add texture to the surface while still allowing the substrate to be read in great detail. Adherence to the inner volume is so strong that gravity goes unnoticed. Draped, on the other hand, is looser, revealing less of the core, and registers gravity, conveying difference between top and bottom.

Y-S1 Elastic Stretch



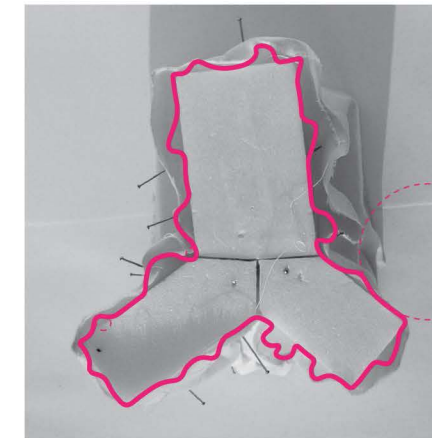
Deviation from inner corners compromises program (floor plate becomes too deep)

Y-S2 Stuffed



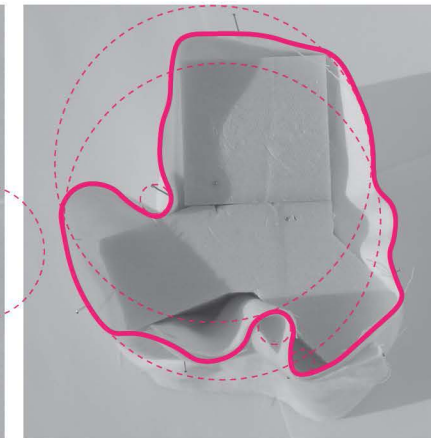
Deviation from inner corners compromises program (floor plate becomes too deep)

Y-WD1 Wet-Draped



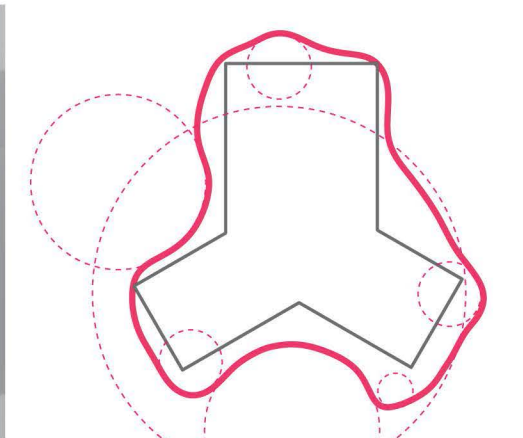
Close adherence to inner form provides surface texture more than new form. Deviations are episodic.

Y-D1 Draped



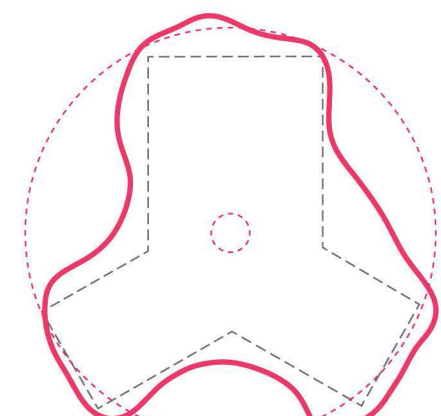
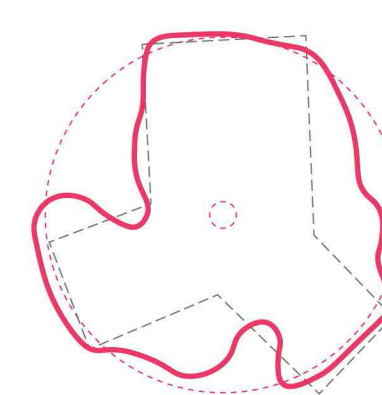
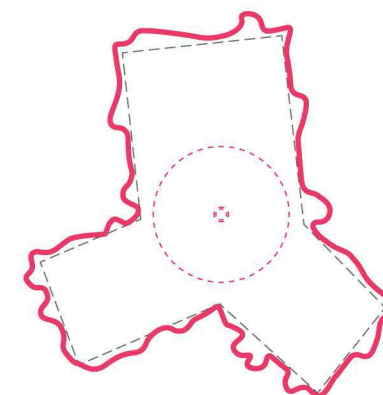
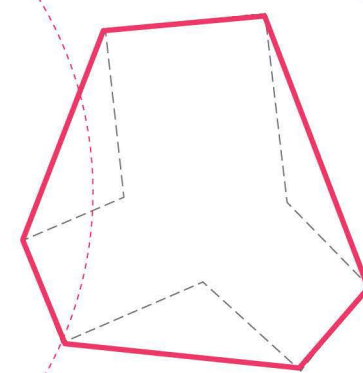
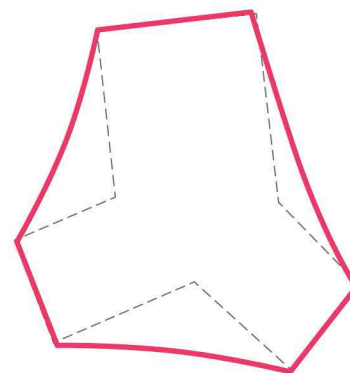
Too loose. Inner volume is lost.

Draped and Droopy



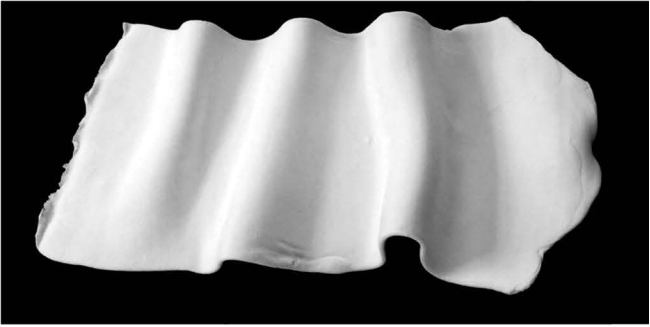
Drapes in soft, even folds, Not too tight and not too loose Stretches in the direction of gravity.

Figure 19-2. Forms of indexical softness. Analysis of physical models. Different kinds of indexical softness produce specific forms and specific formal relationships to the inner core. The diagrams to the right illustrate the deviation from the original through photograph and horizontal section. The latter enables an evaluation of each strategy in the context of the present project. The range of radiuses of the the new undulating outline clarify the degree of formal deviation from the inner core.

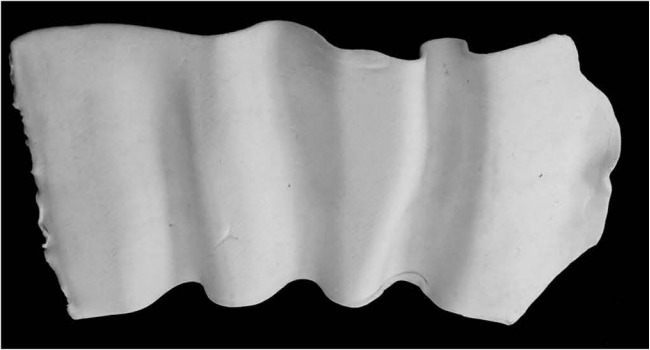


Draped and Droopy falls in soft, even folds and stretches slightly in the direction of gravity. It is smooth and slumpy; not puffy, wrinkled or deflated, suggesting a thick but plastic material. It is not as dynamic as Gehry’s wet-draped Spruce Street tower, or Studio Gang’s Aqua Tower; it moves slowly and sags, suggesting a sluggish pace of transformation. The folds and ripples create an intermediate scale between overall object and interior unit (floor, room, balcony or window), which is also present in Gehry’s and Studio Gang’s examples. This intermediate scale is essential in escaping a pure textured effect. In tall buildings (30 storeys or more) the size of living units relative to overall building dimension is too small. Bertrand Goldberg’s Marina City in Chicago (completed in 1964) and Herzog & De Meuron’s Leonard Street tower in New York (2006-2016) are two examples where the manipulation of balconies generates a textured effect that does not challenge the overall scale of the building.

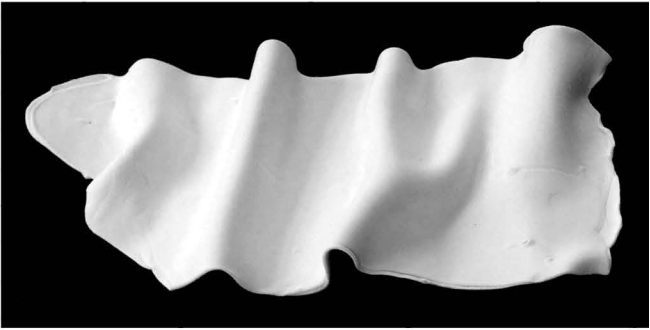
Figure 20. Draped and Droopy models. Pink overlay highlights especially successful aesthetic effect produced, in part, by a balanced relationship between scale of fold and overall dimension.



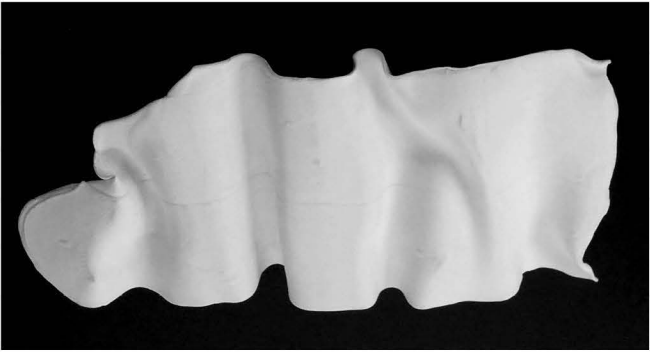
F-DD1 top



F-DD1 bottom



F-DD2 top



F-DD2 bottom



Y-DD2.1



PY-DD3



PY-DD4



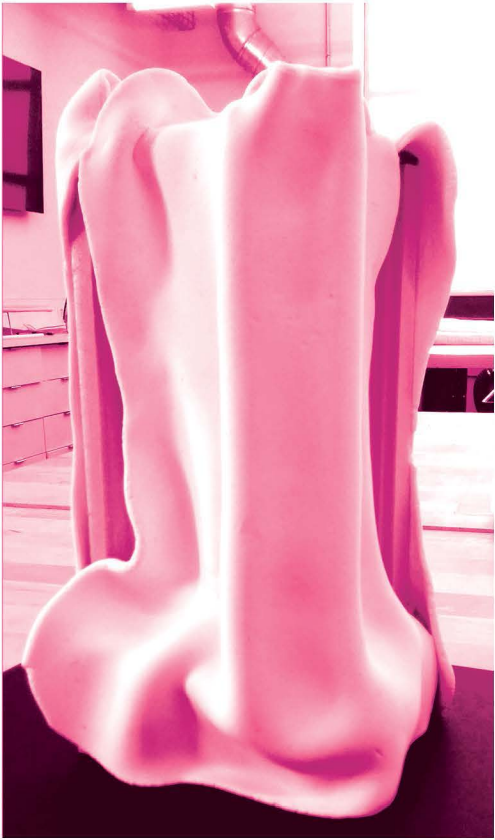
PY-DD5



Y-DD2.2



Y-DD1.1



Y-DD1.2

Thick Form, Thin Veil

In architecture (and in art) materials are often manipulated to take on the appearance of something else. In the past, architectural elements superseded by technological development kept being represented in spite of their uselessness. For example, the triglyphs of ancient Doric temples, which represented the beams of original wood temples, were carved onto the face of a solid stone frieze block.

For many centuries artists strived to represent fragility and softness in a permanent way. In ancient Greek sculptures the folds and pleating to garments were carved in great detail onto the stone sculptures. In Bernini's *The Rape of Proserpina* (1621-22) the softness of the skin is masterfully translated to marble. Today, Jeff Koons's mirror-polished stainless steel *Ballon Dog* (1994-2000) is an enlarged reproduction of a cheap, inflatable, everyday object, made precious (and also heavy and rigid) through material translation. Sam Jacob's *Solid Shadow*, a full scale clay cast of a basketball, works similarly, but the contrast between the bouncy quality that makes a basketball useful and the fragile reality of the clay object makes the translation more intriguing.

Similar strategies have been used in architecture. The solid, undulating buildings of Eladio Dieste (1917-2000), the Uruguayan engineer and architect, seem to flow up, from the ground, liberated from gravity.

Frank Gehry's billowing shapes are usually fixed and completely rigid, executed in formed stainless steel; In *The Pagoda*, designed by Miguel Fisac (1913-2006) and completed in 1968 in the outskirts of Madrid, Spain, cast concrete is formed to appear stretched between twisted floors. These strategies of material displacement, whereby the qualities commonly attributed to a given material are challenged by form, contribute to the main ambition of engaging the subject's awareness.

Functionally, the Soft Vertical Wrapper needs to accommodate the programmatic requirements of work and residential spaces. In 8 Spruce Street, as in other projects by Frank Gehry, the continuous, waving form of the building is overlaid, and interrupted, with a functional grid of openings (voids or protruding rectangular volumes).¹² Thus, the waving form operates mainly within the *poché* of the envelope. The current project proposes a different strategy: a continuous porous screen of expanded metal.

¹² The three-building complex "Neuer Zollhof" in Dusseldorf, Germany, completed in 1998, the so-called "Gehry Tower" in Hanover, Germany, completed in 2001, and Dr Chau Chak Wing Building, UTS Business School in Sidney, Australia, completed in 2015 are some examples where this overlay strategy is employed.



Figure 21. Gian Lorenzo Bernini, *The Rape of Proserpina*, 1622 (partial view)

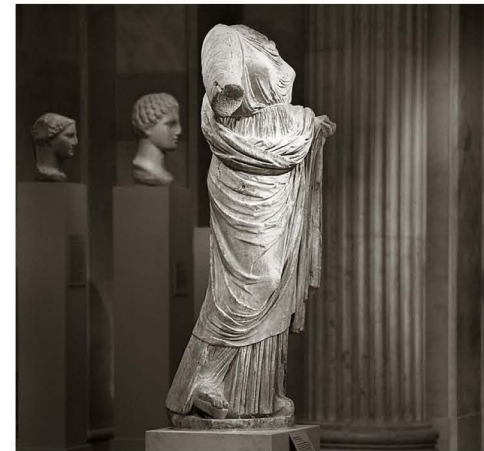


Figure 22. Marble Statue of a Woman, Greece, Late Classical Period, 2nd half of the 4th century B.C.



Figure 23. Sam Jacob, *Solid Shadow*, 2012 (clay-cast basketball)



Figure 24. Eladio Dieste, *Church of Christ the Worker*, Estación Atlántida, Uruguay, 1960

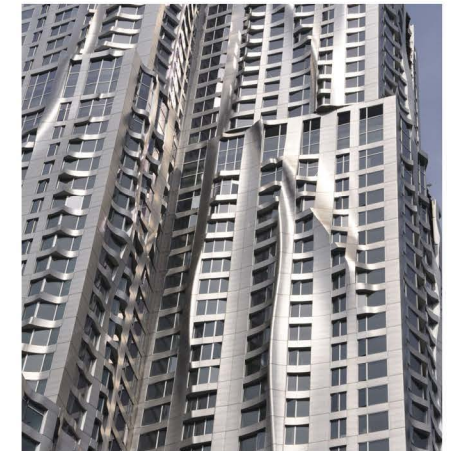


Figure 25. Frank Gehry, 8 Spruce St, New York, NY, 2010

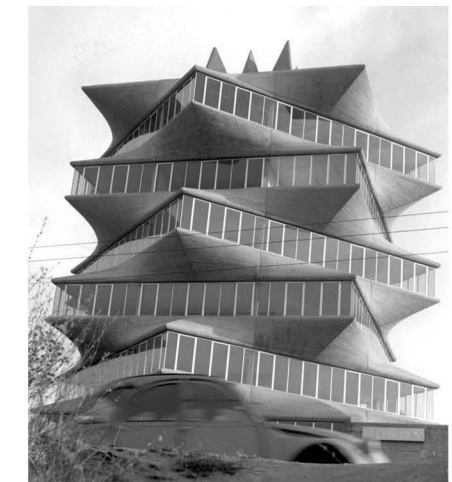


Figure 26. Miguel Fisac, *The Pagoda*, Madrid, Spain 1970 (demolished 1999)

The reasons for this choice are manifold. Firstly, a continuous see-through screen can be experienced from the interior in a way that Gehry's poché cannot, increasing the spatial relevance of the wrapper. Although up-close the scale of undulation is larger than that of living spaces, the "Y" plan offers several opportunities to see the exterior face of the screen from the inside. Secondly, panel seams can easily be concealed, reinforcing continuity. The New Museum by SANAA in New York City (2002-2007) is a good example. Thirdly, opening patterns can be manipulated to produce specific double curved forms from a flat panel. Reiser + Umemoto's Vector Wall of 2008 is a promising precedent in this regard. Finally, the specular and diaphanous qualities of expanded metal, which oscillates between transparency and opacity depending on light incidence and viewer position, cause the heavy, draped and droopy sculptural form to appear and disappear.



Figure 27. SANAA, New Museum, NYC, 2002-2007



Figure 28. Reiser Umemoto, Vector Wall, 2008

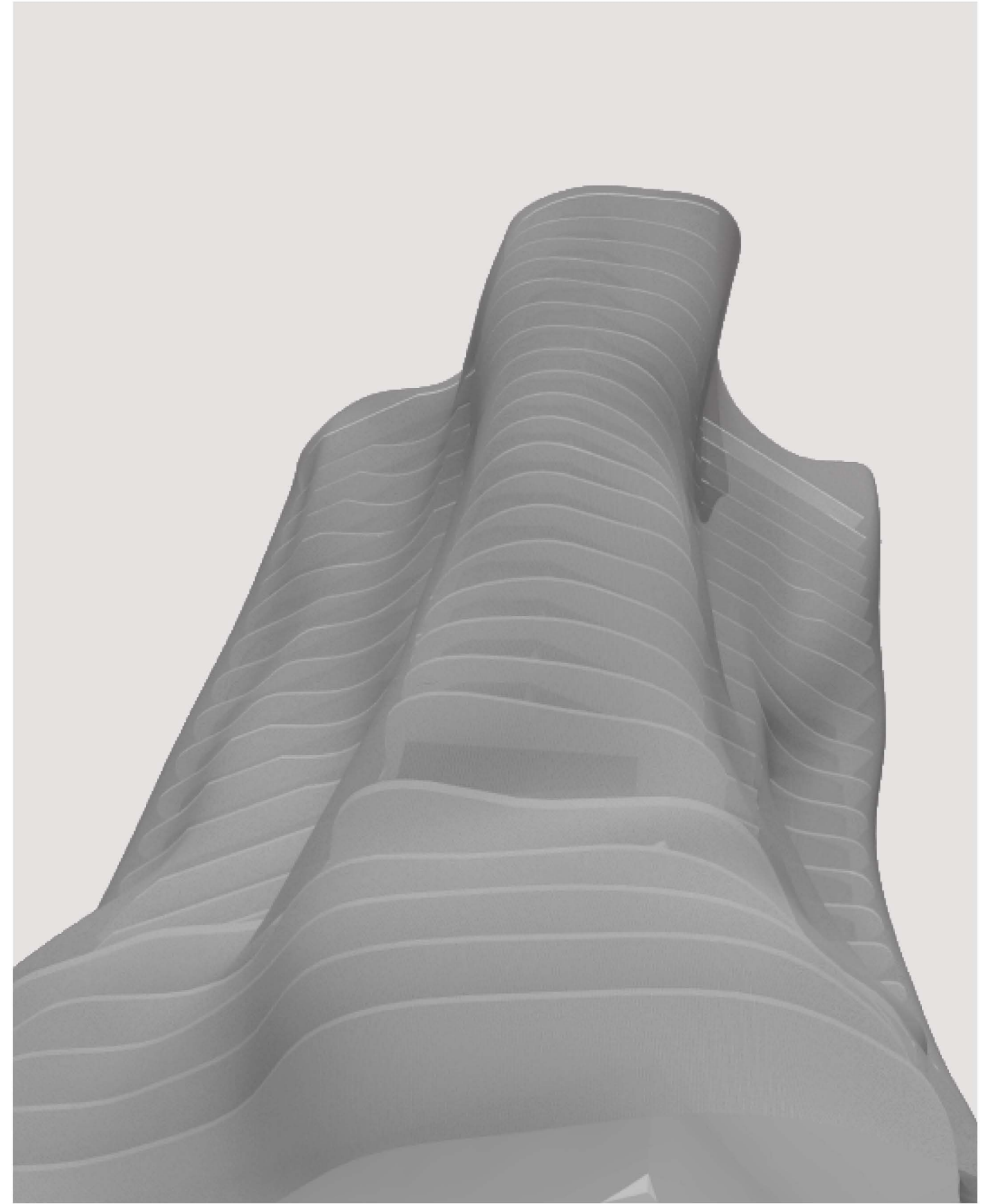
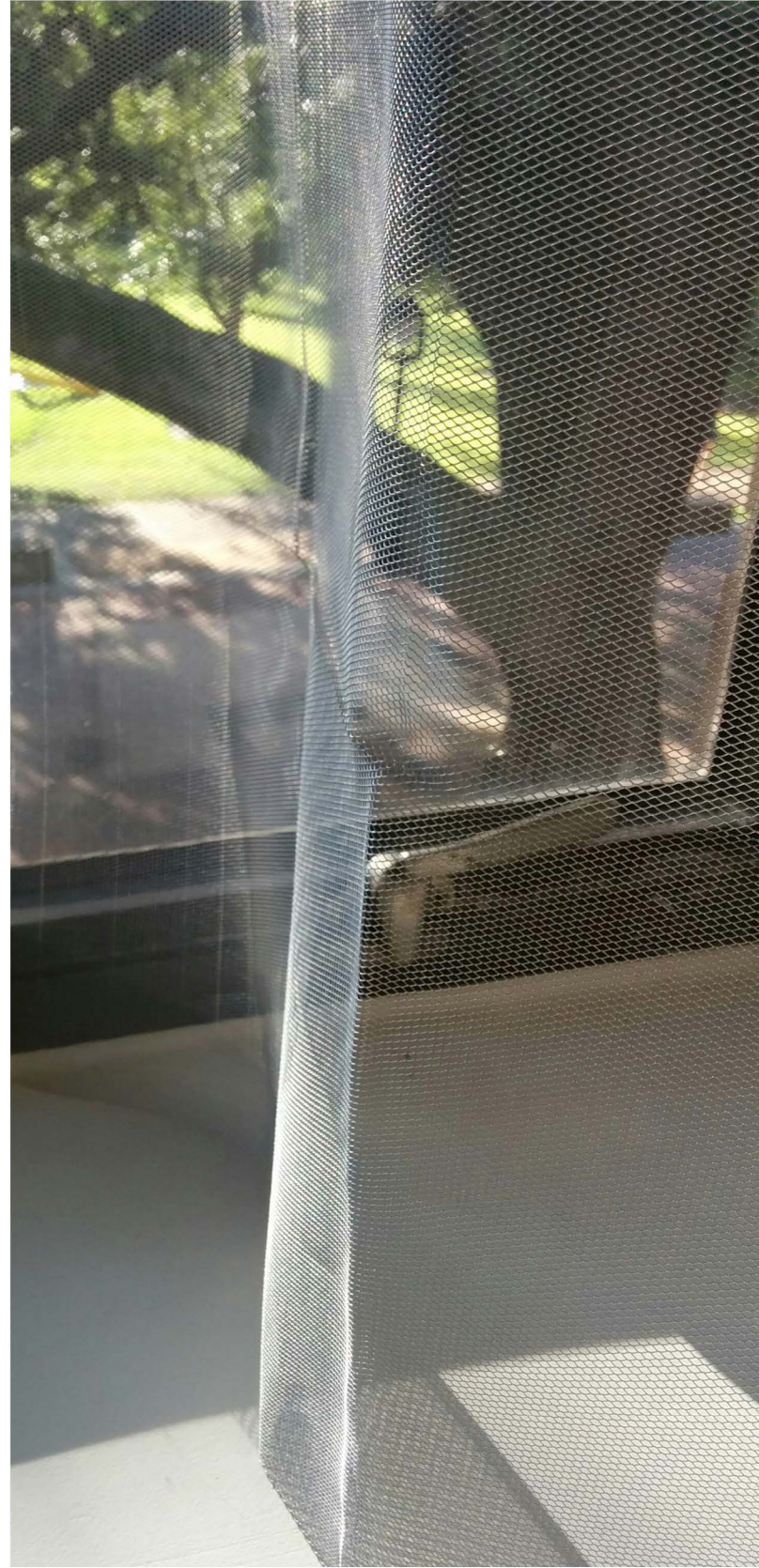
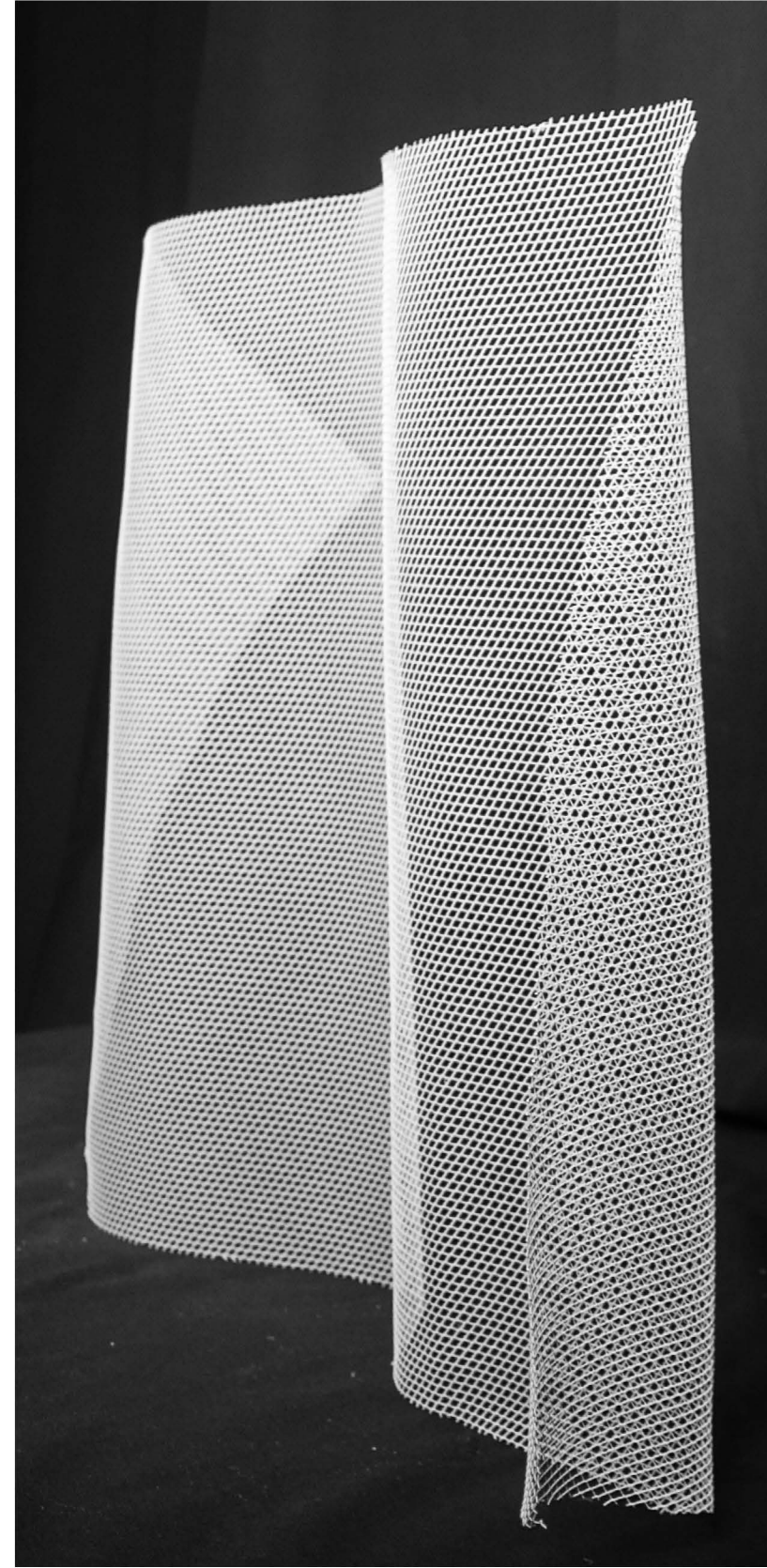


Figure 29. Working render of soft vertical wrapper



Figures 30, 31 and 32. Expanded metal samples. The specular and diaphanous qualities of expanded metal, which oscillates between transparency and opacity, depending on light incidence and viewer position, cause the heavy, draped and droopy sculptural form to appear and disappear.



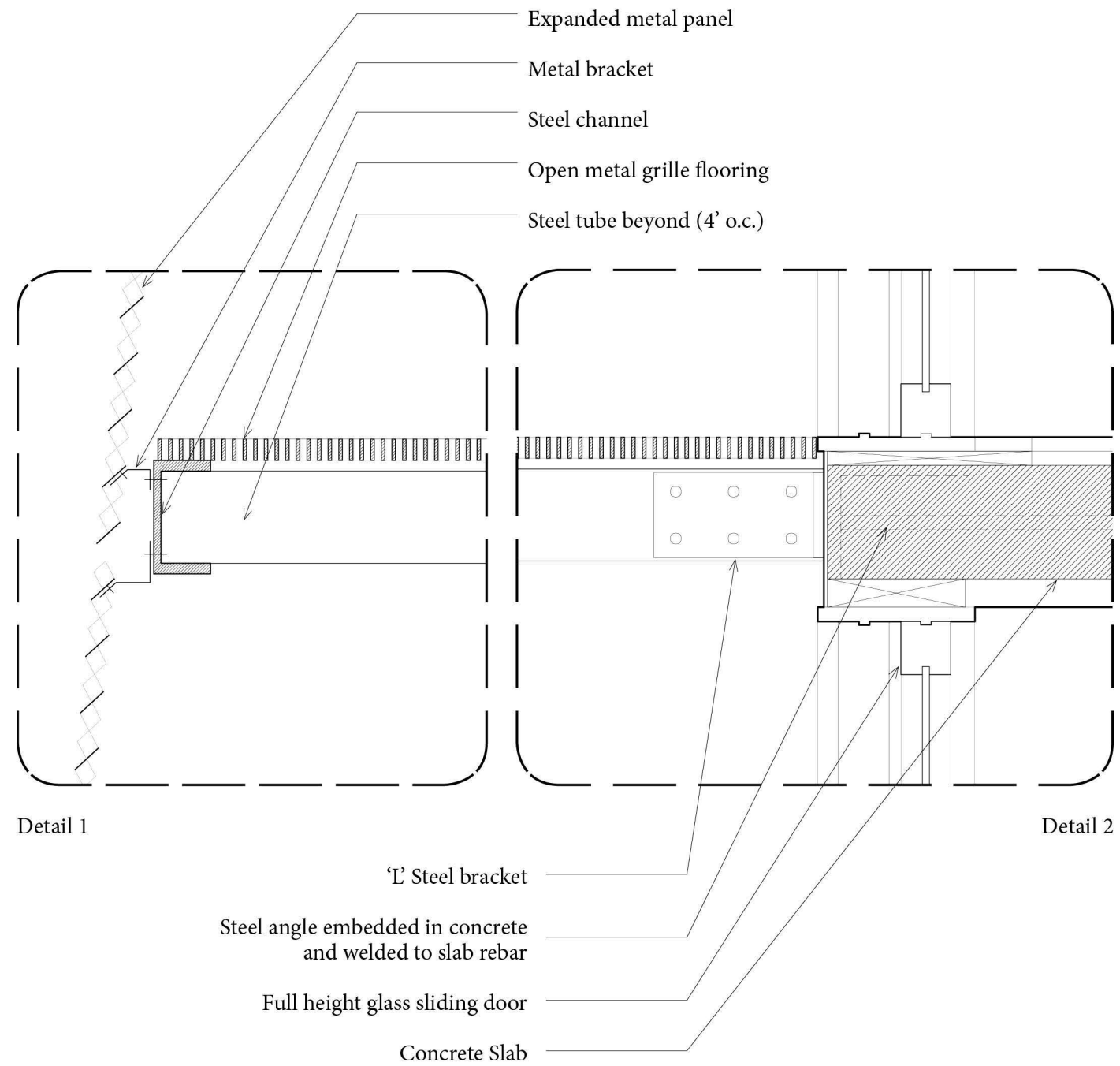


Figure 33. Cross section details of Soft Wrapper Assembly.

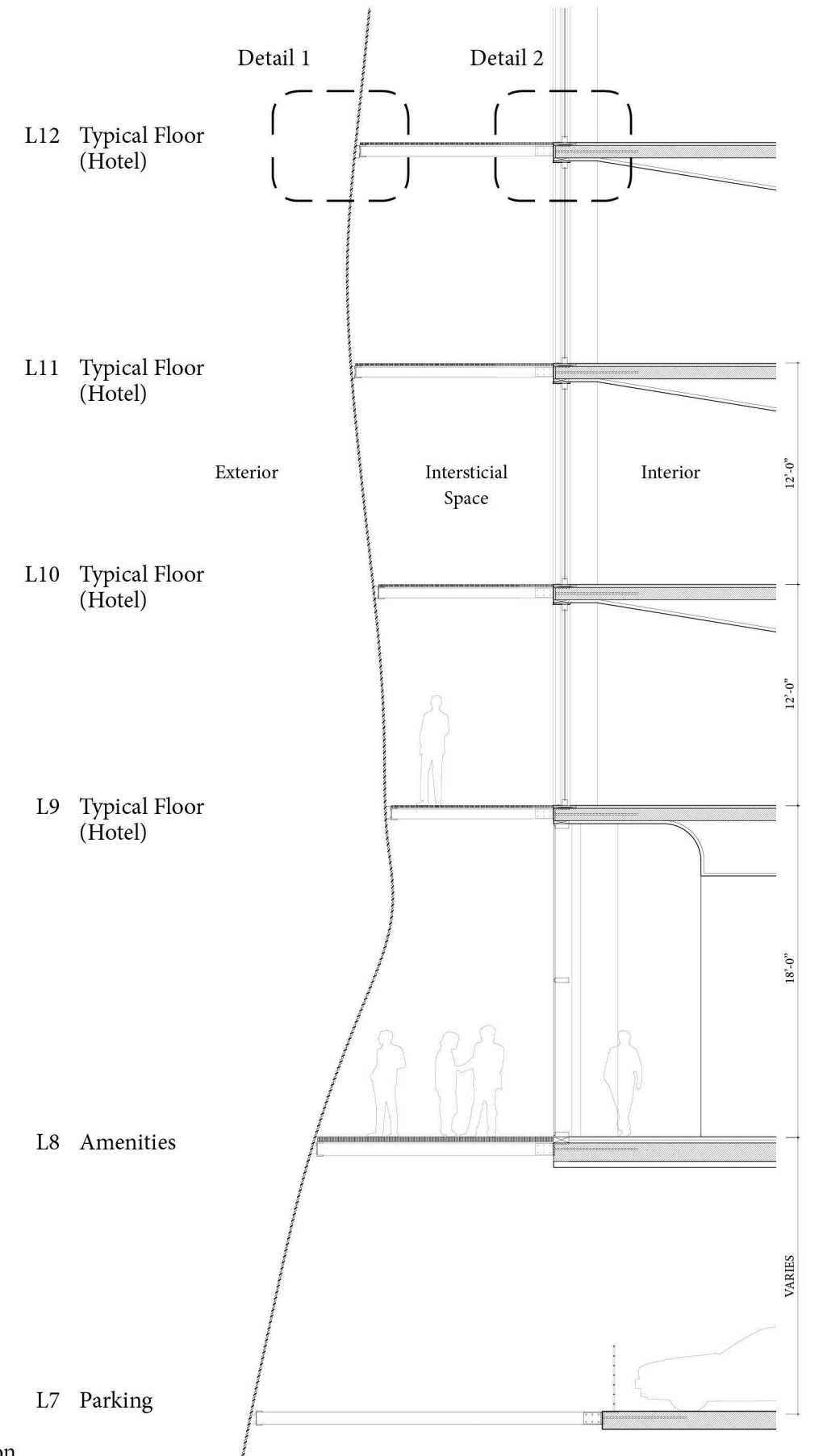
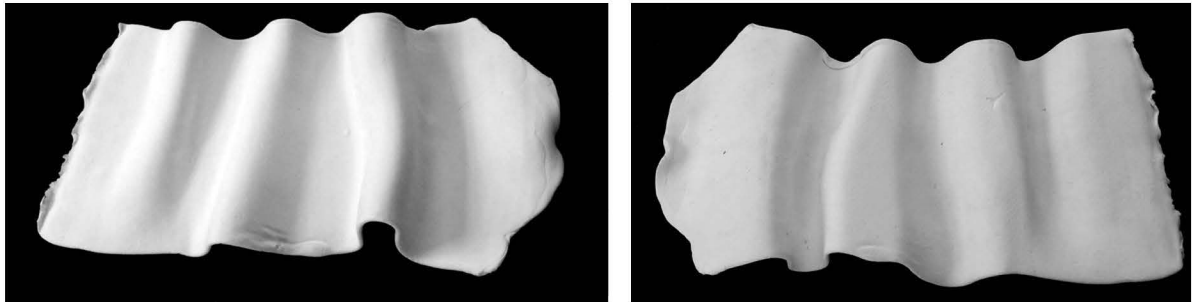


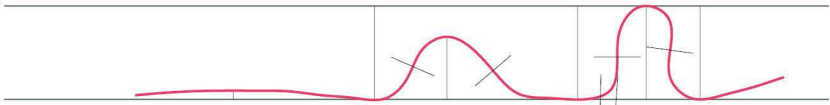
Figure 34. Partial envelope section

The Rules of Draped and Droopy

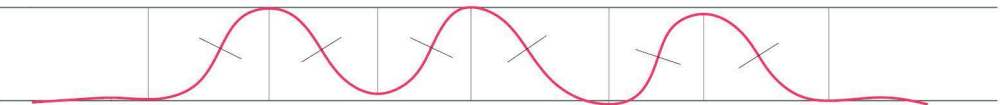


F-DD1

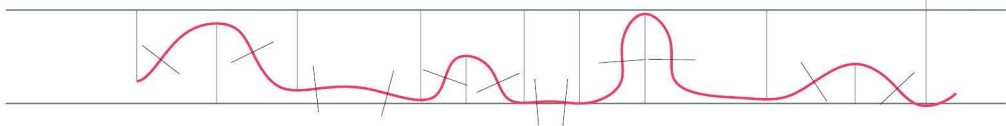
F-DD2



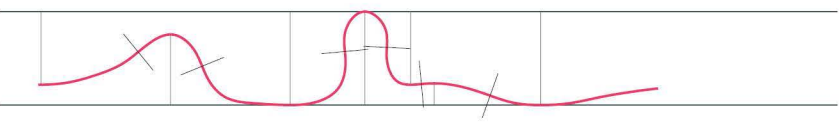
Cross Section 1



Cross Section 2



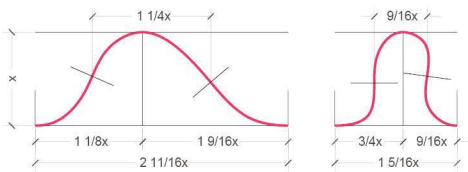
Cross Section 3



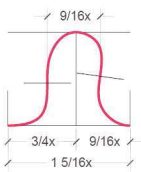
Cross Section 4

Peaks

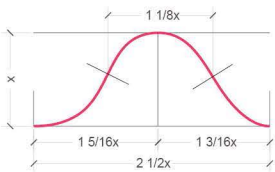
Troughs



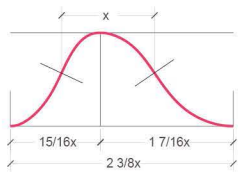
P1



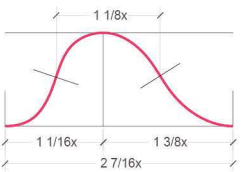
P2



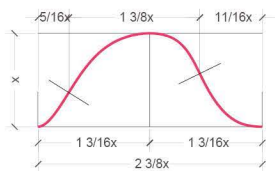
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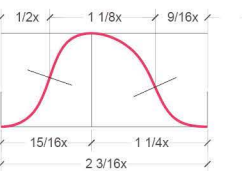
P4



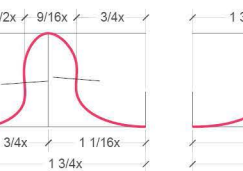
P5



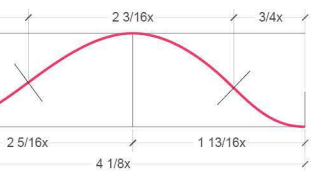
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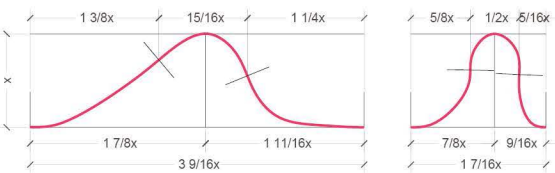
P7



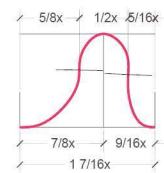
P8



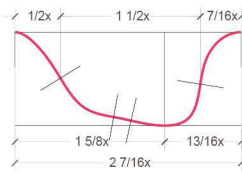
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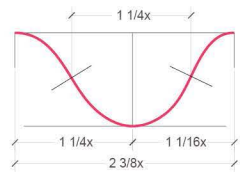
P10



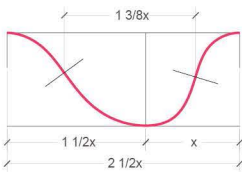
P11



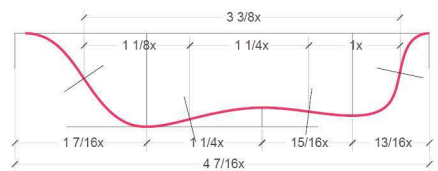
T1



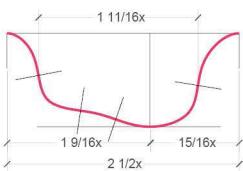
T2



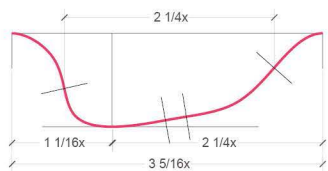
T3



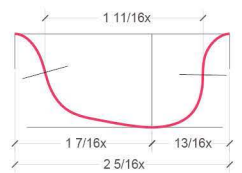
T4



T5



T6



T7

Figure 35-1. Analysis of flat, draped and droopy models F-DD1 and F-DD2 through cross section analysis of peaks and troughs.

The Rules of Draped and Droopy

Draped and Droopy is smooth, continuous and soft. Its formal qualities, derived from intuitive, physical models, are tightly connected to the material properties of Model Magic®¹³. In this chapter the geometrical features of draped and droopy are analyzed to enable a reverse engineering of the design process developed to this point. This study is an essential step

in the definition of the thesis as an idea that can be used in a different context. The recourse to Euclidean geometry is intended to tie the wrapper back to the mass production logics that produce the sameness and repetition of the core.

Initial analysis focused on very simple models. See figure 35-1. The first one, F-DD1, has three independent ridges, straight or slightly curved,

flattening from one site to the other or continuous across the material. The second one, F-DD2, is slightly more complex in that some ridges merge into each other. The main conclusion from this first study is that peaks and troughs are not the same. Although the form is continuous, the weight of the material makes troughs generally flatter and wider than peaks. Figure 35-2 illustrates this comparison.

13 A “lightweight”, “clean and extremely pliable” modeling compound produced by Crayola for children aged 5 and older. <http://shop.crayola.com/art-and-craft-supplies/clay-and-modeling/modeling-compounds/model-magic-2-lb.-resealable-bucket---white-5744001005.html>

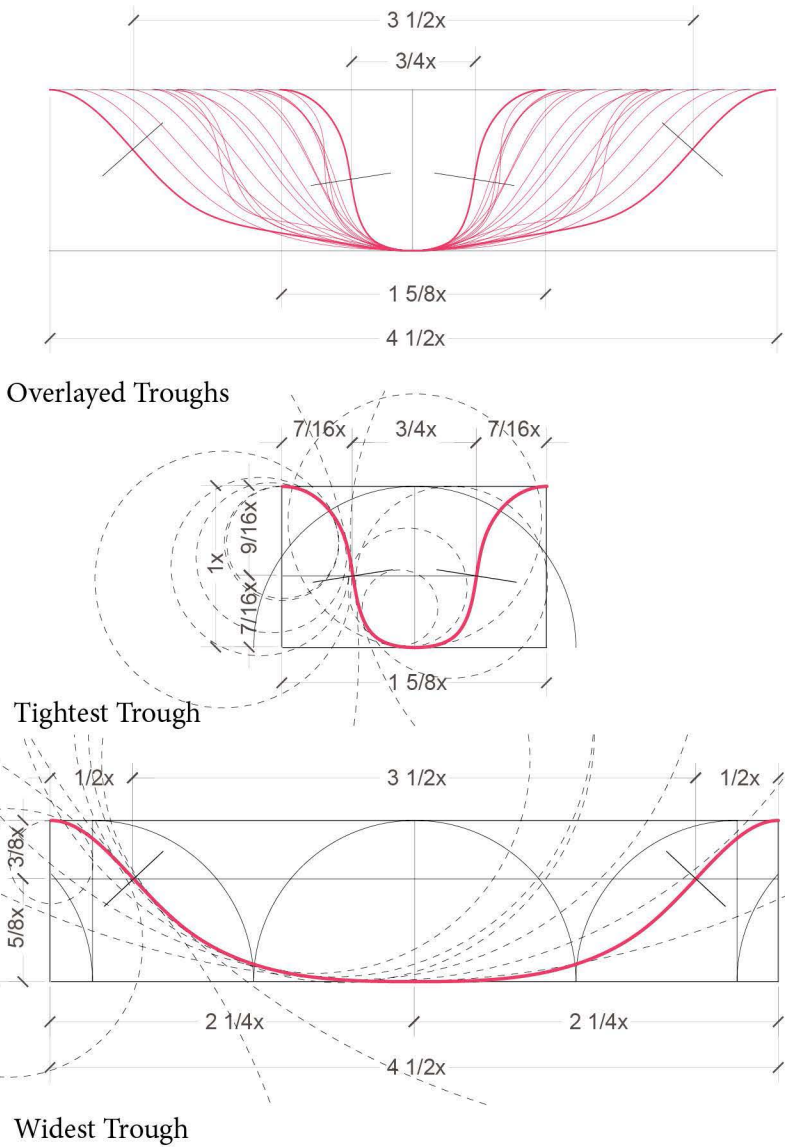
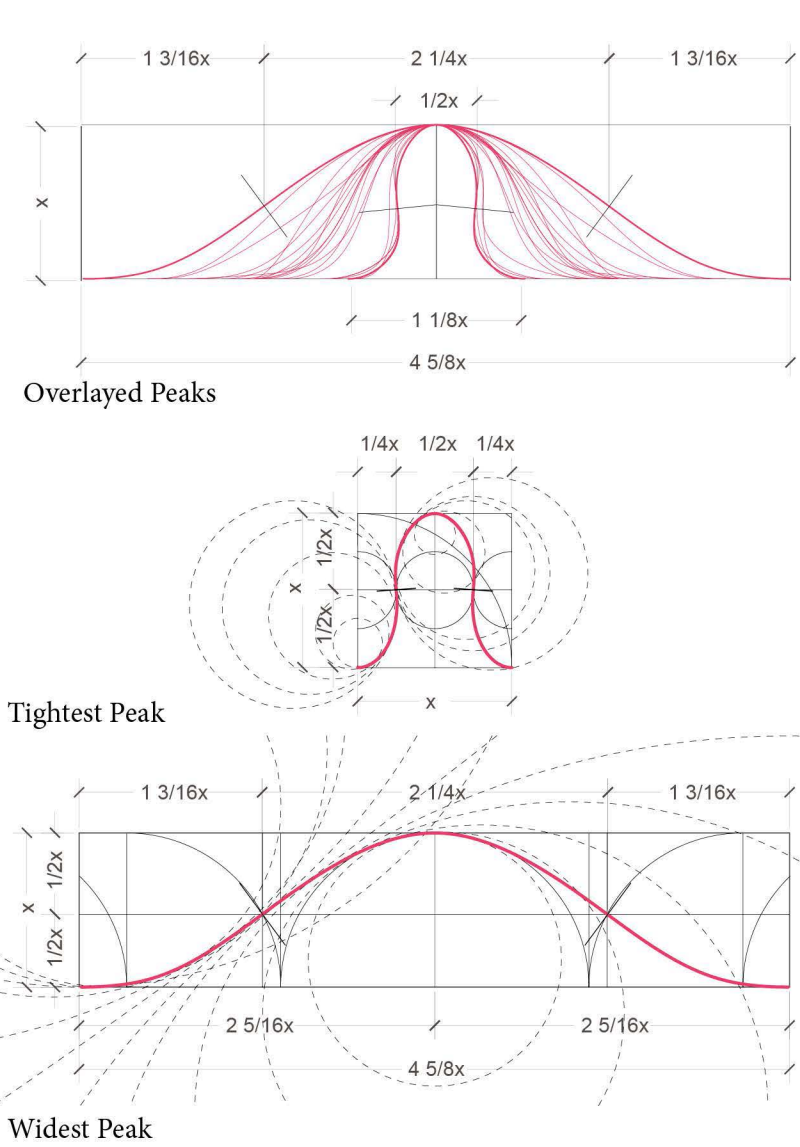
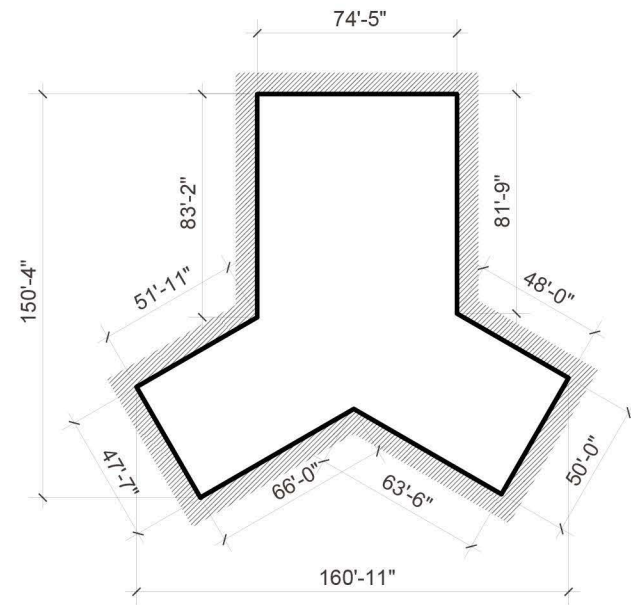
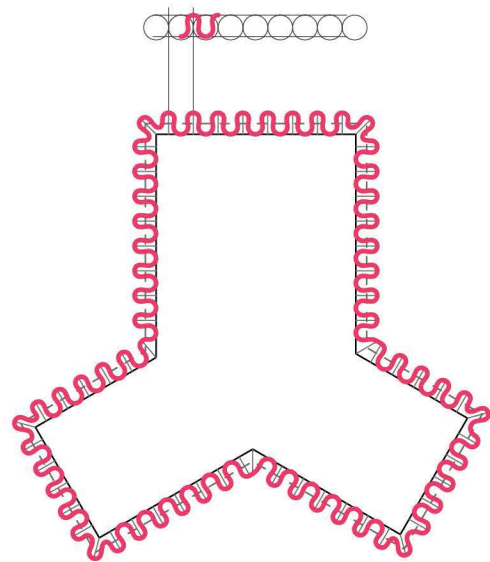


Figure 35-2. Peak and Trough comparison. Although their geometry is very similar, troughs tend to be wider and flatter than peaks, generating the previously mentioned droopy effect or a slight stretch in response to gravity.



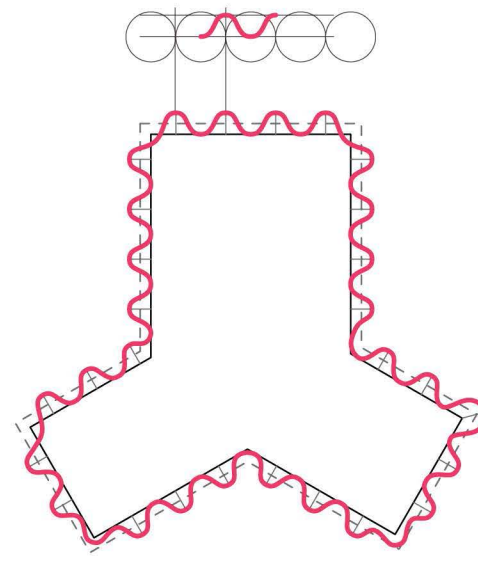
0

566' length
0% fullness



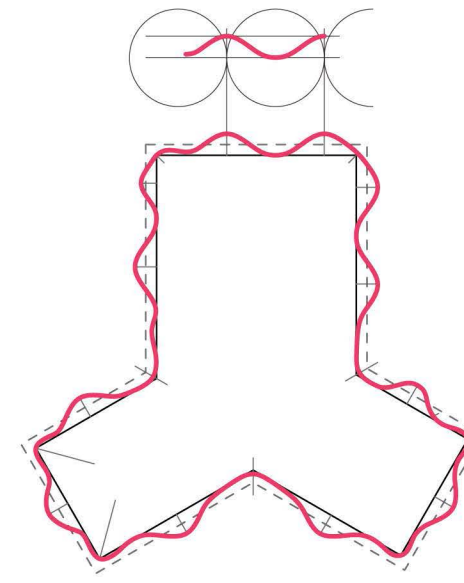
1

7 peaks on short faces
9'-3" wavelength
1316' length
132% fullness



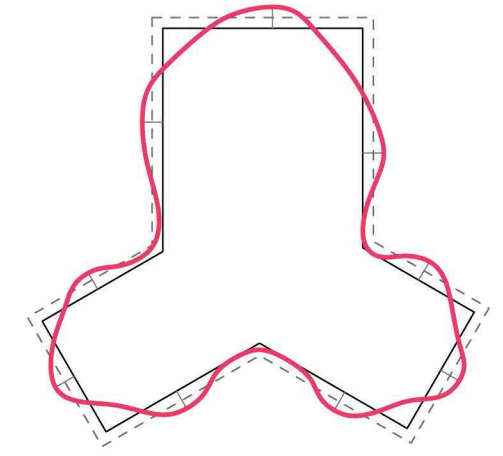
3

3-4 peaks on short faces
18'-7" wavelength
791' length
40% fullness



6

3 peaks on short faces
36' wavelength
616' length
8% fullness



8

1 peak on short faces
n/a wavelength
548' length
-3% fullness



Figure 36-1. Outline diagrams of soft wrapper produced through variation of wavelength

Using the parameters for peaks and troughs defined in figures 13 and 14, and working within an eight foot offset from the previously defined Y volume, a series of outlines were produced, where wavelength is related to the shortest face of the original figure.

Fullness, a measure of the ratio between length of fabric and length of track for a curtain, can be used to evaluate the results (a flat curtain, whose length is the same as that of the track would have 0% fullness). In figure 15, the horizontal pink band represents the length of the new perimeter while the length of the

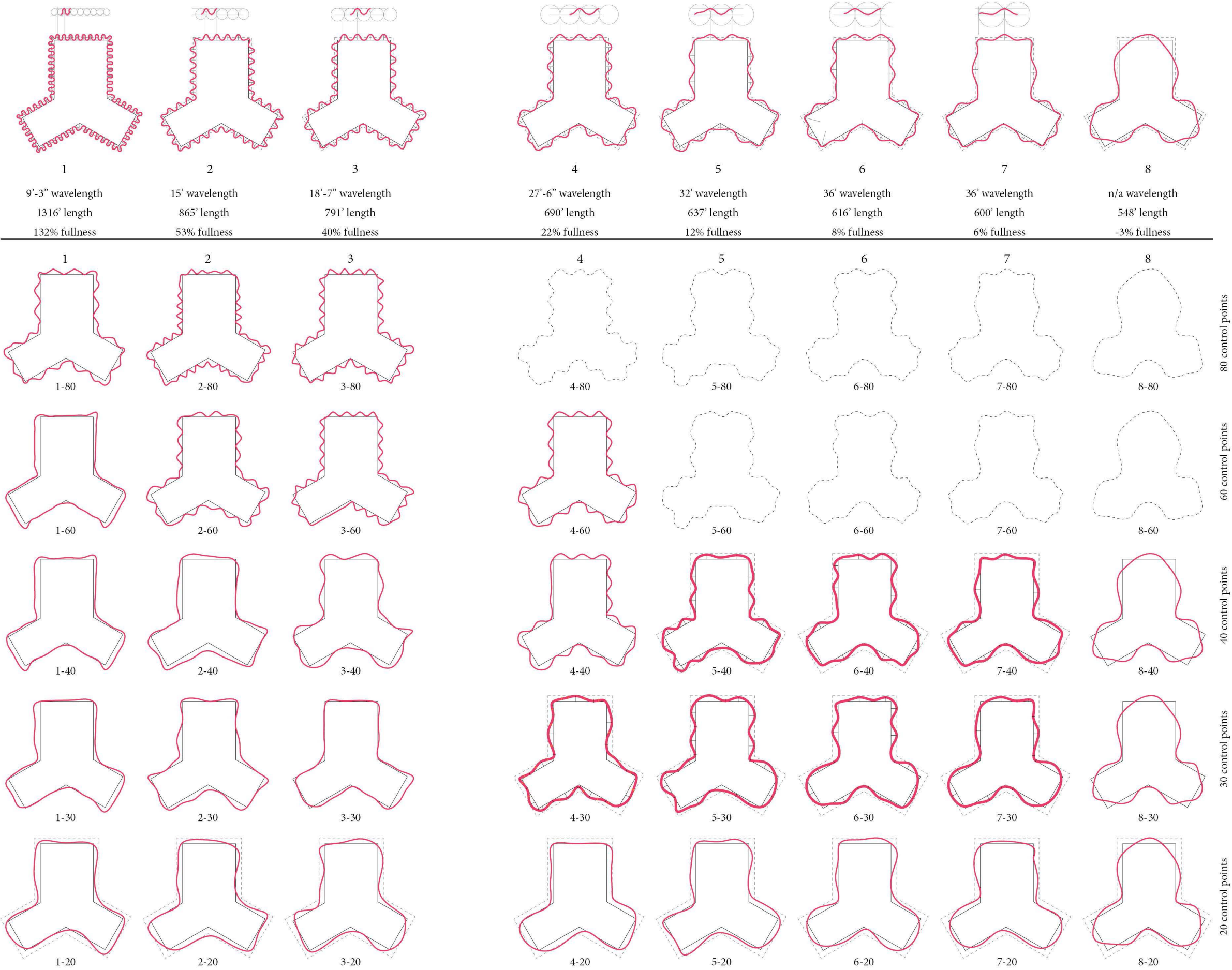
black band indicates the perimeter of the original Y figure.

The results of this exercise suggest a desirable proportion between undulation and overall plan dimension. In the first two diagrams, the wavy perimeter still reads as texture, while on the last one, by eroding the corners, the inner volume is lost and the original 'Y' shape is replaced by a sort of cloverleaf. In diagram 6 of figure 36-1, the number of peaks and their alignment to outer corners maintain the 'Y' figure while challenging its perception.

Another important feature of the soft vertical is its asymmetry, which reinforces fluidity and instability. Reducing the number of control points that define the spline outlines of diagrams 1 through 8 on the top row of figure 36-2, is an expedient way to produce variation. The highlighted diagrams on the matrix (4-30, 5-30 and 5-40, 6-30 and 6-40, and 7-30 and 7-40), are successful in remaining at the sought point between texture and form.

The selected outlines are further examined in figure 36-3. The radiuses of peaks and troughs are compared on the upper right corner, revealing that most are one quarter or smaller than the largest one. The continuous range where the circles are closer suggests that production efficiencies could be found by picking discrete radiuses and adjusting each outline accordingly. Another important conclusion that can be extracted from figure 36-3 is that between texture and form depends on the ratio of peaks to outside corners of the original figure. In the seven diagrams this ratio varies between 1.5 and 2.5. This allows the peaks to blend in with the outside corners, obscuring the clarity of the inner “Y”.

Figure 36-2. Outline diagrams of soft wrapper produced through variation of wavelength and number of control points.



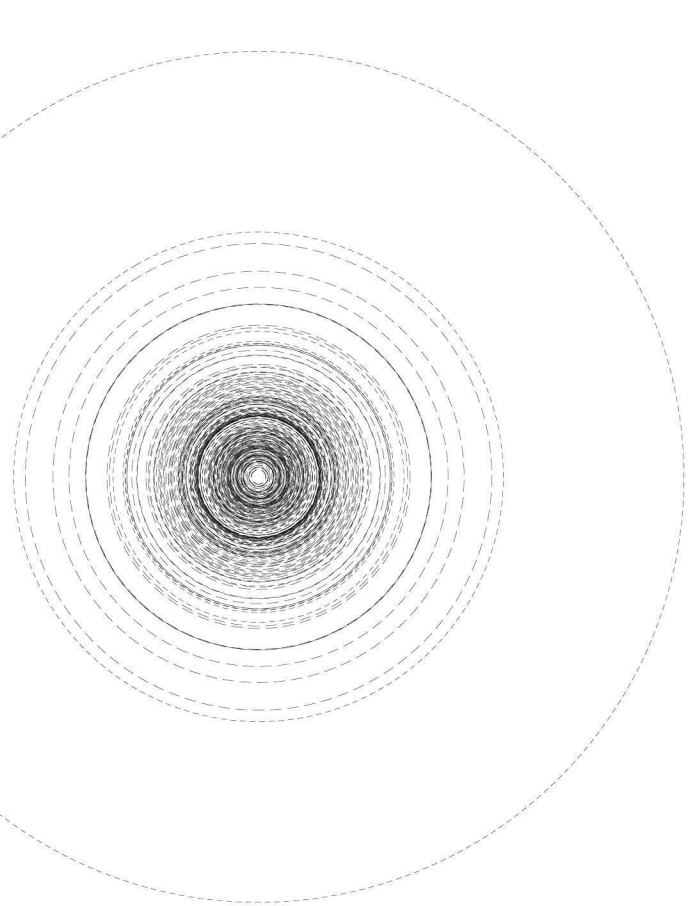
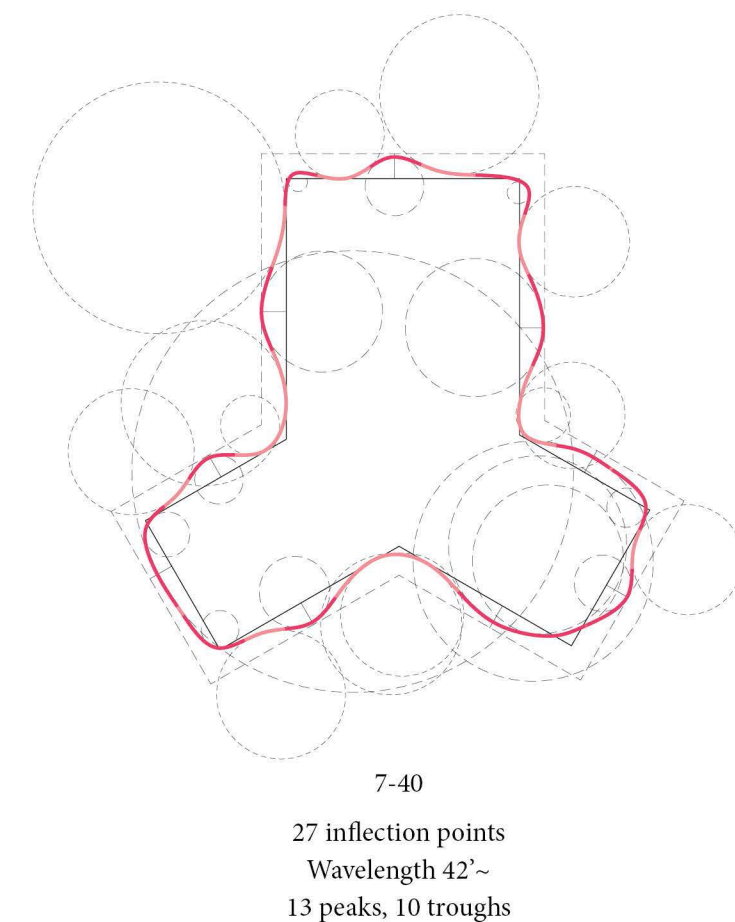
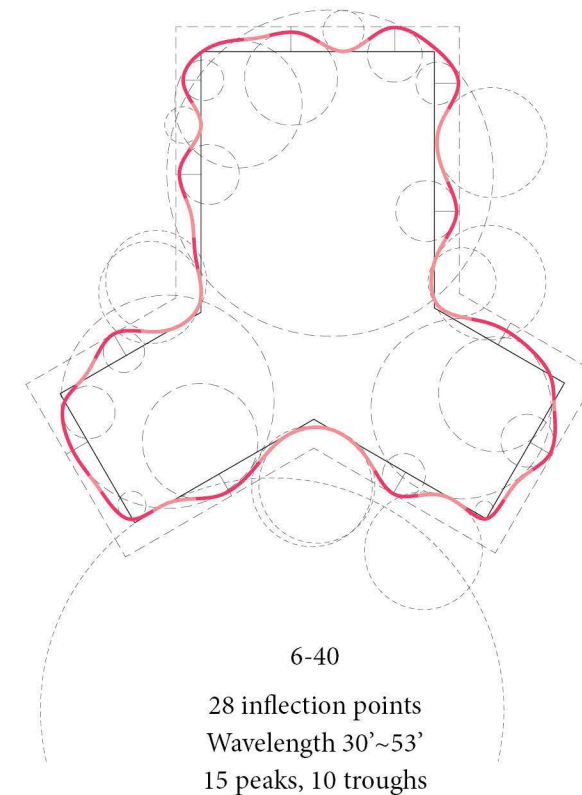
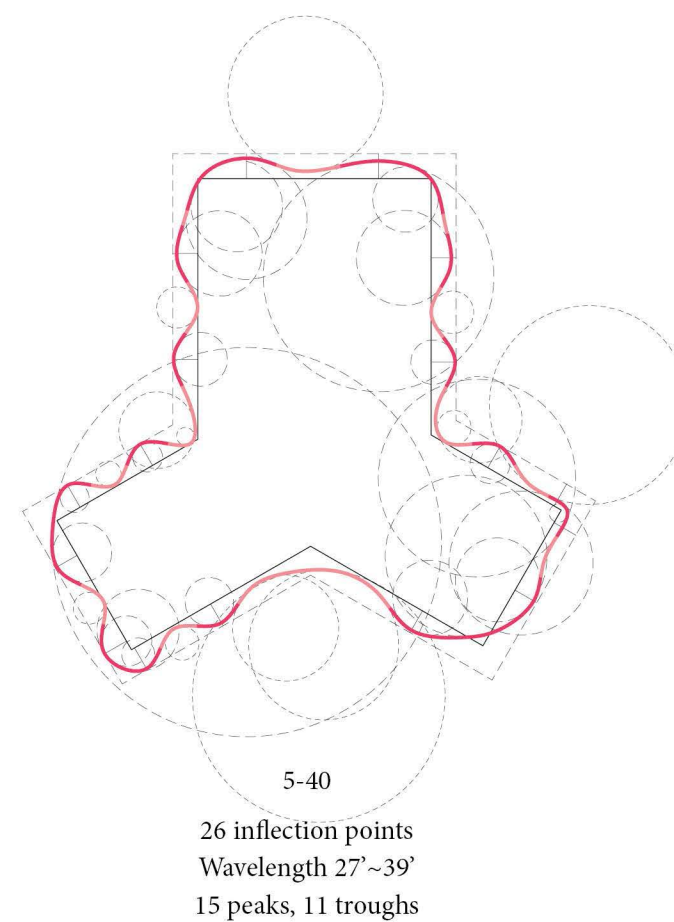
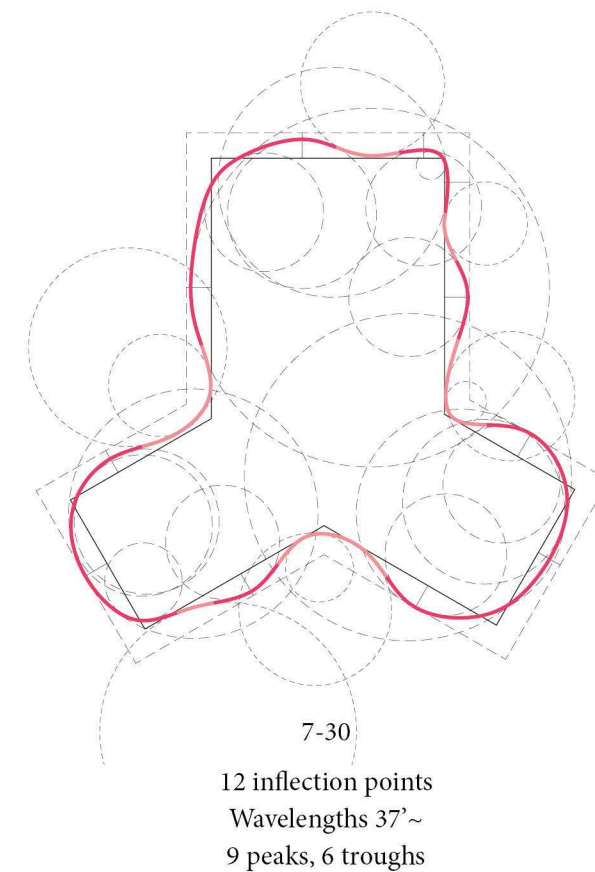
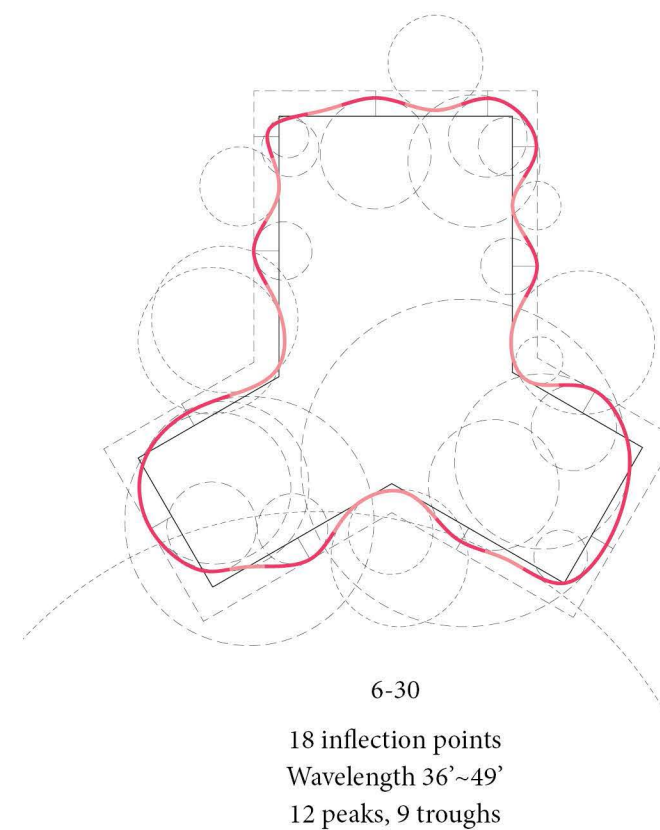
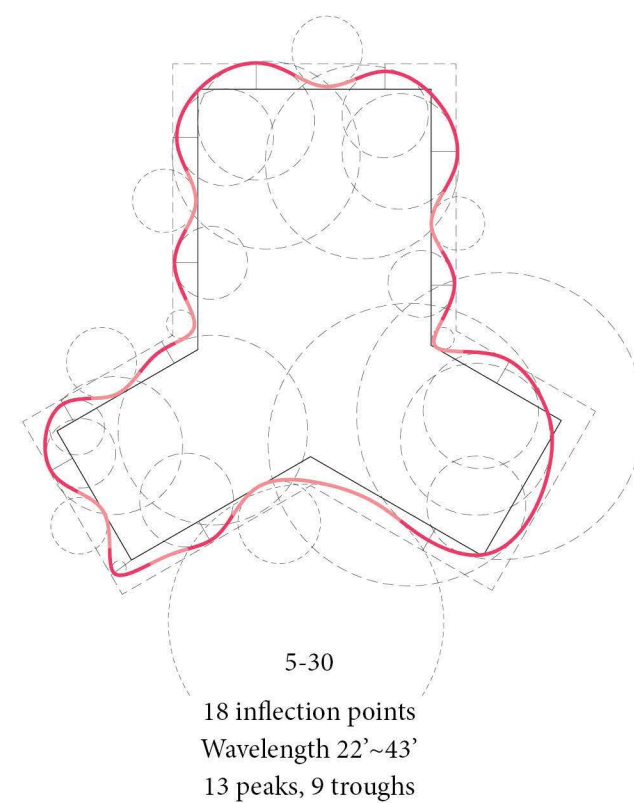
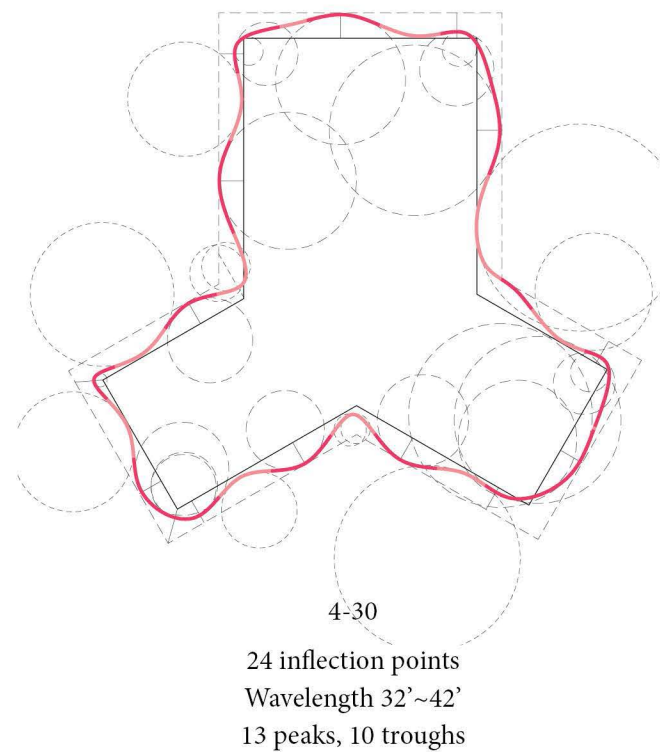


Figure 36-4. Overlap of peak and trough radiuses.



41



42

Figure 36-3. Curvature analysis of selected outlines from figure 16. The ratio between number of peaks and number of outside corners in the original 'Y' figure varies between 1.5 and 2.5.

In figures 37 and 38, a similar strategy is applied to the study of vertical deviation of ridges. Ridges associated with corners (labelled C) are more consistent throughout the shaft of the building, with local, small scale deviations from the vertical axis and more consistent variations at the top and base of the building. ‘A’ ridges on the other hand, long vertical ridges that are independent from the outer corners of the “Y”, tend to be more oblique to the vertical axis and display surprisingly consistent disturbances around their midpoint.

A redesign of the Vertical Soft Wrapper based entirely on the analysis presented above would provide a definitive evaluation of this method. Unfortunately, time constraints prevent such investigation from being included. Instead, priority was given to the representation of one instance of the Soft Vertical Wrapper, which facilitates the evaluation of the stated ambition – to engage a subject’s awareness.

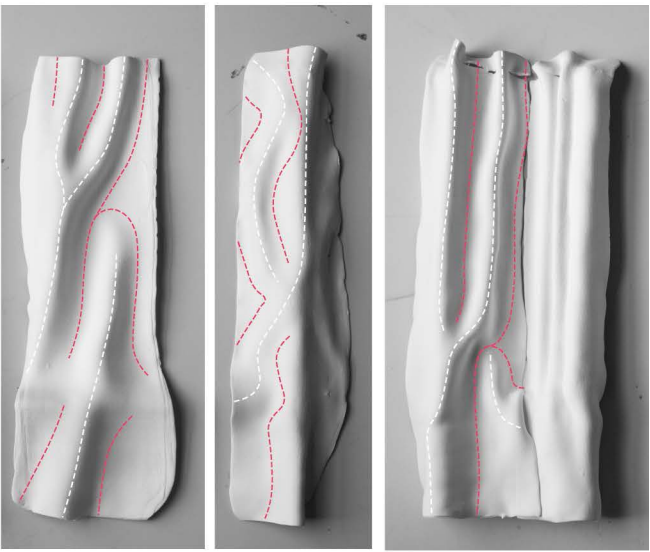


Figure 37-1. Initial analysis of vertical ridges and valleys

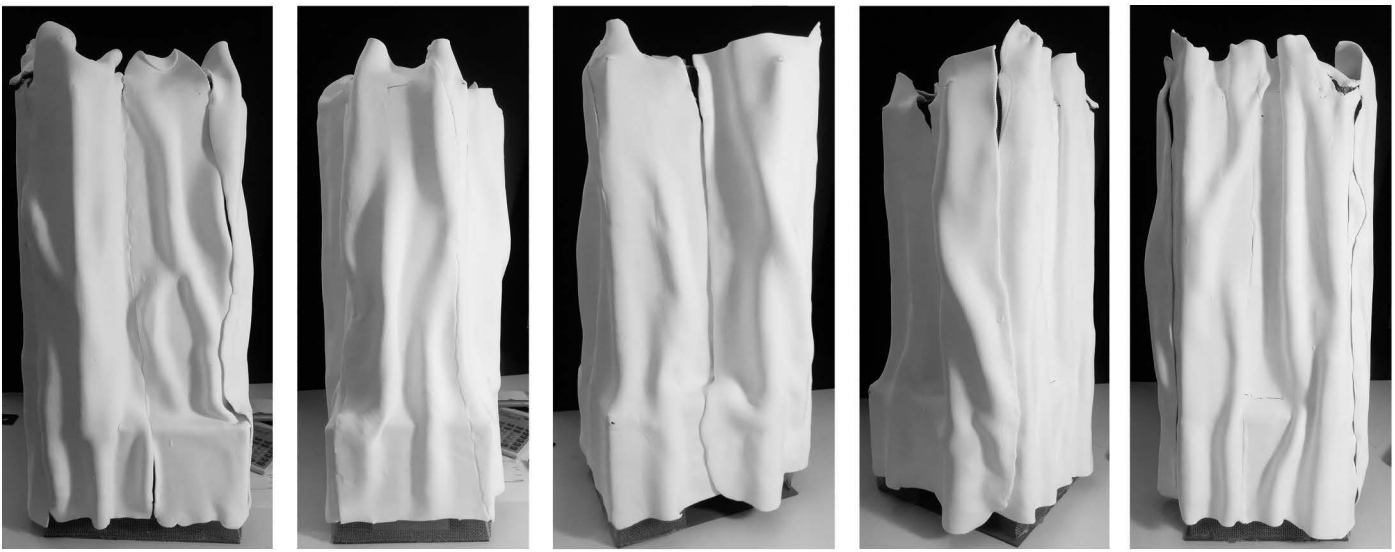
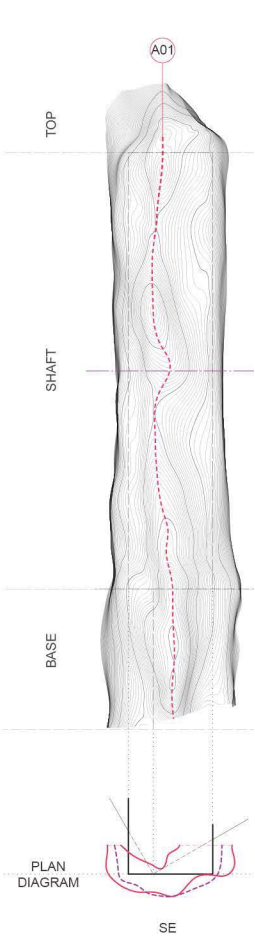


Figure 37-2. Five views of ‘Y’ draped and droopy model #2 (Y-DD2)

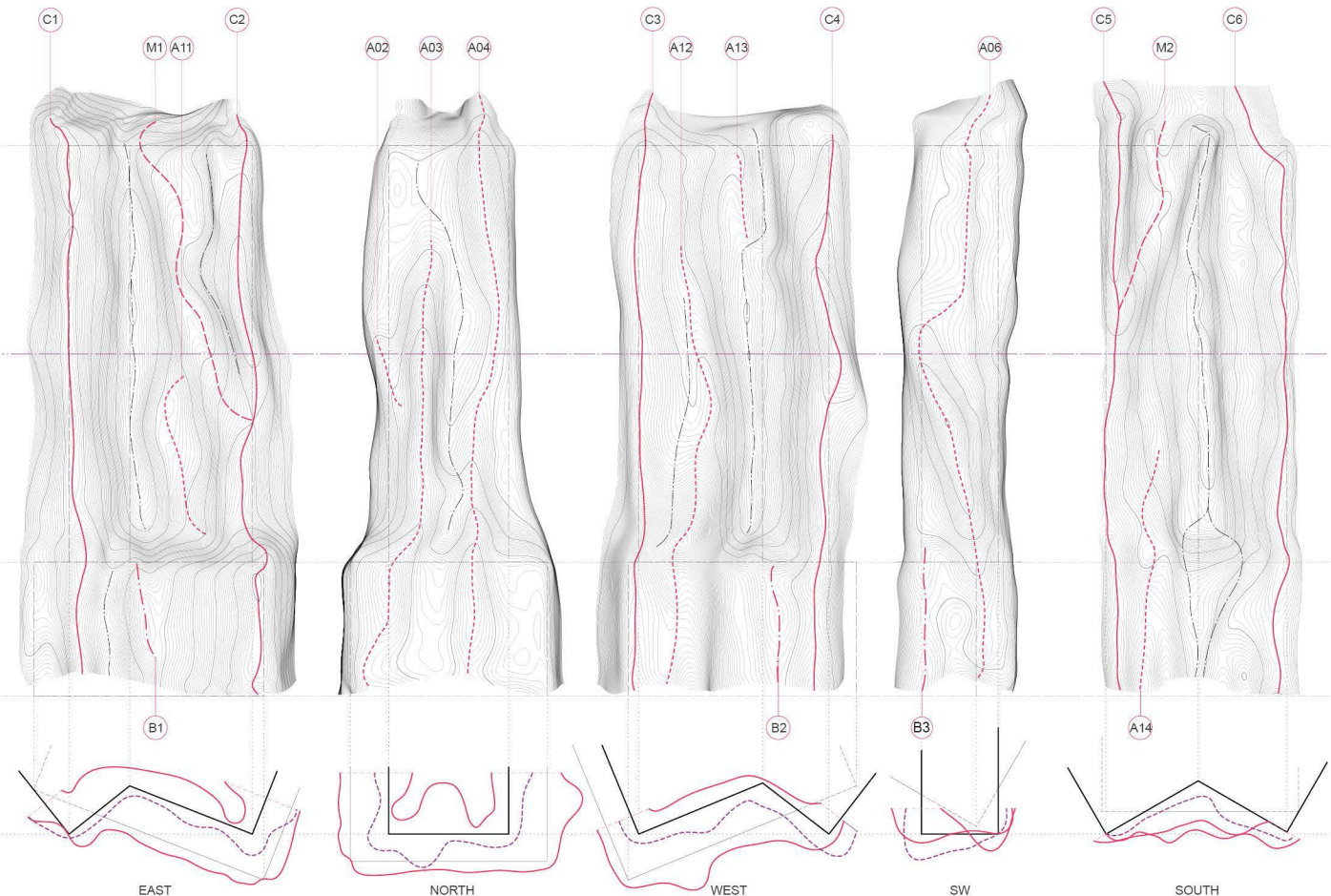
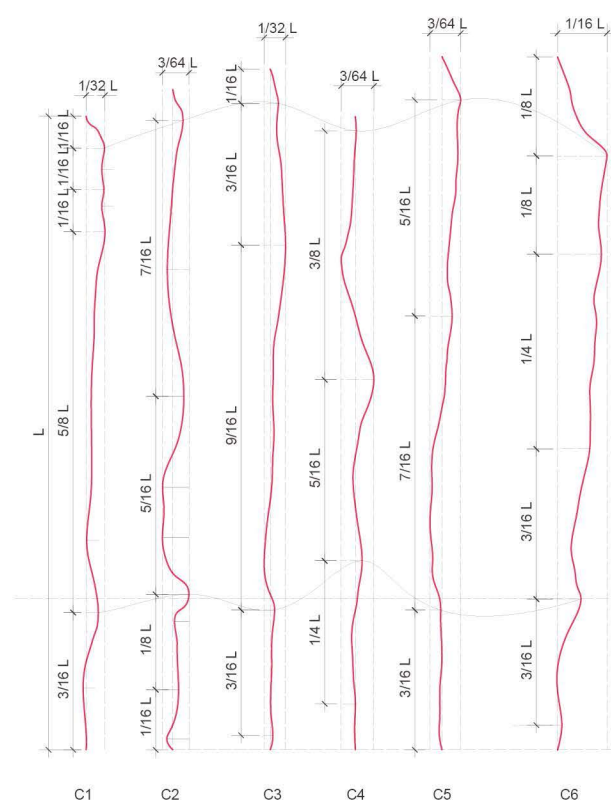
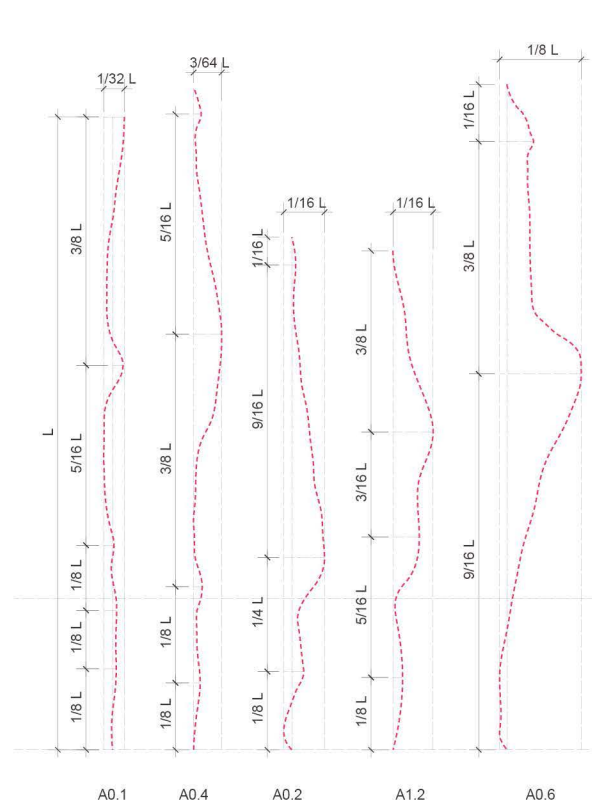


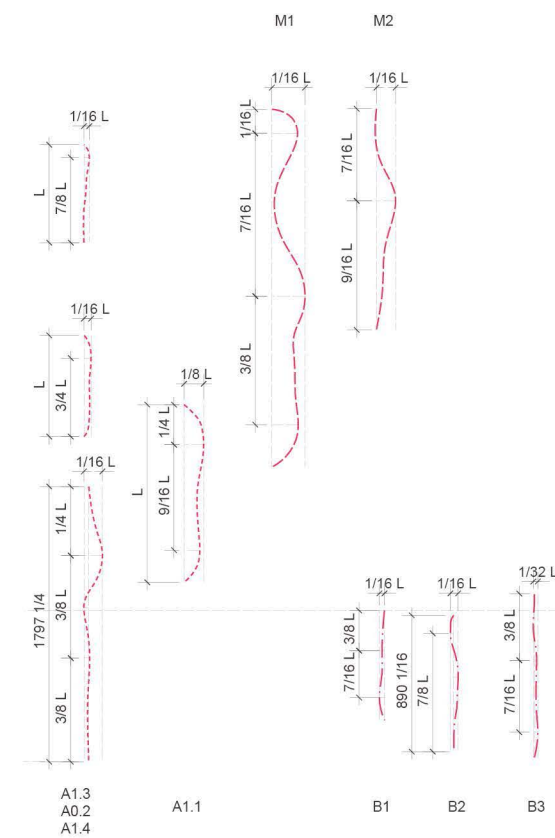
Figure 37-3. Topological analysis of Y-DD2 model. Dashed pink lines indicate ridges.



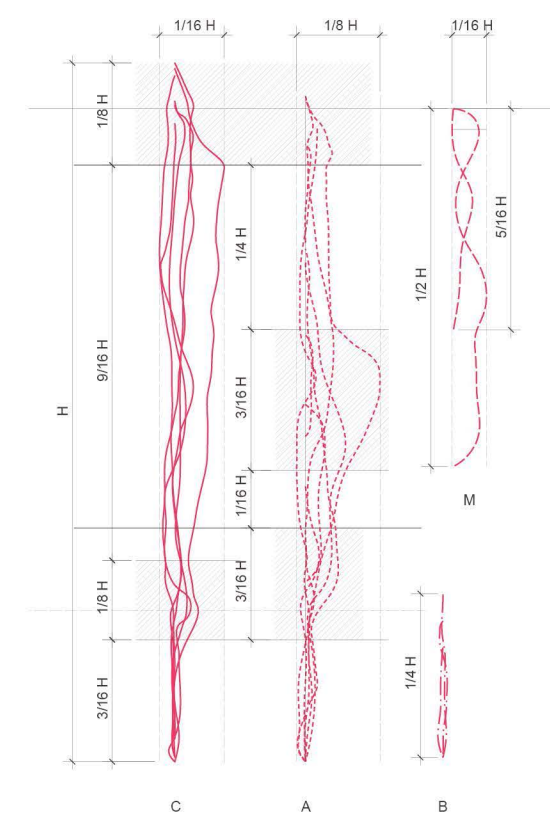
1. C - ridges (associated with corners)



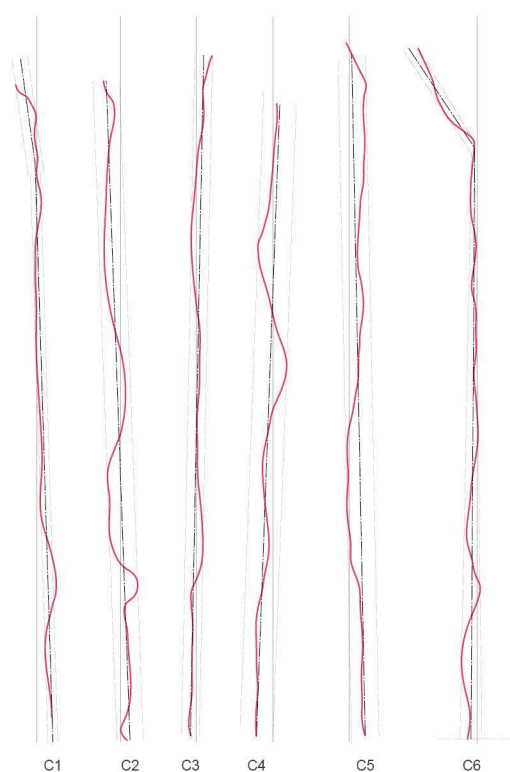
2. A - independent ridges



3. B - base specific ridges



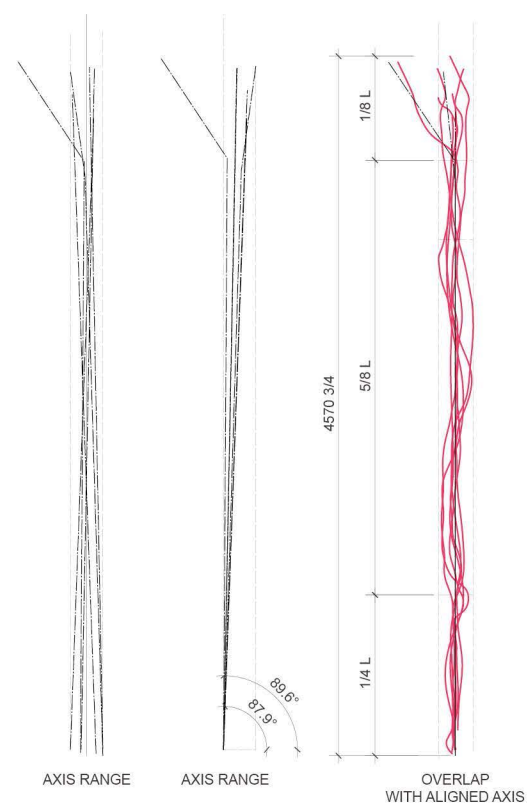
4. overlaid ridges by type



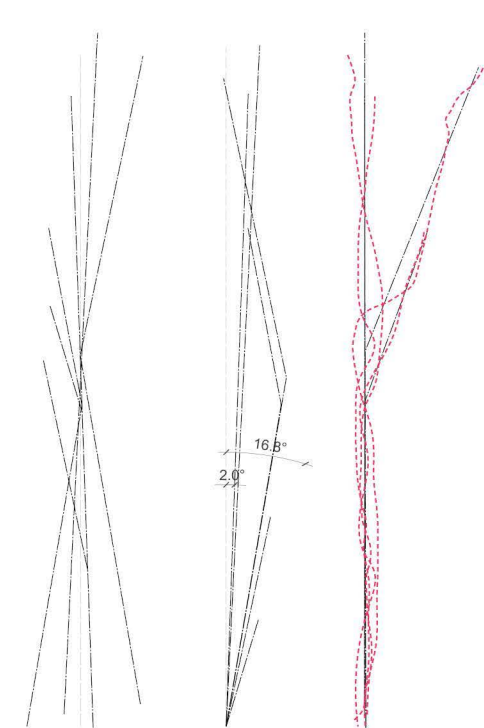
5. C - ridge deviation



6. A - ridge deviation



7. C-ridge deviation comparison



8. A-ridge deviation comparison

Figure 38-1 through 8. Comparative analysis of ridge geometry, and vertical deviation. In figures -4 and -7, base and top can be identified by zones of increased irregularity on the geometry of the ridge lines;

In figure 4, a mid-height disturbance is also legible as a consistent feature of A-ridges (independent from corners)

Between System and Object

Architecture operates between systems, understood as ideas and sets of rules, and objects or specific instances. In the current project an effort was made to address both by establishing a clear ambition and defining the rules that can produce it, and by developing one example that can take on more specificity and higher definition.

Site and program criteria, defined in the second chapter, informed the planning of the inner “Y”, while the form of the soft wrapper was developed through physical models, which were 3D-scanned for analysis and manipulation.

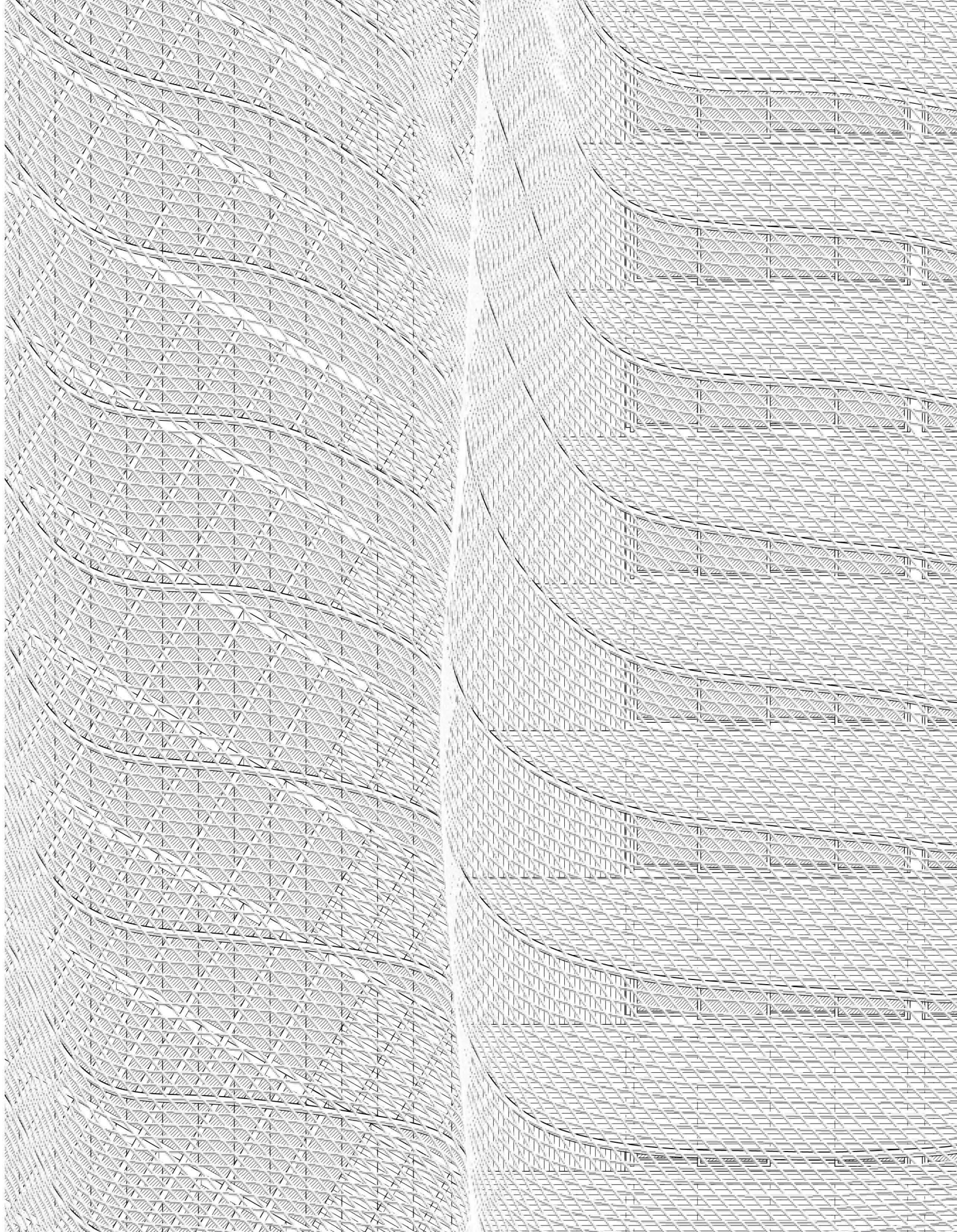
The development of a single instance of this thesis in Houston encouraged the investigation of its representation. Large line drawings (60” tall): an oblique plan showing the whole tower, and a cross section were used to represent the technical aspects of the Soft Vertical Wrapper. These drawings were quite successful. Representing core and wrapper exclusively with black lines causes them to collapse onto each other, reinforcing the connection between the two. Perspectives were also explored, produced through a combination of rendering and collage, which emphasize the diaphanous quality of the expanded metal wrapper.

Throughout the development of the current thesis, several limitations, related the design of the object

were brought to light. The inability to produce large scale models that could allow for a greater definition of the material qualities of the wrapper pushed the study away from physical experimentation and into digital representation. Software proficiency also influenced the definition of the project in that better control of digital programming tools would certainly have influenced the design process if not the result.

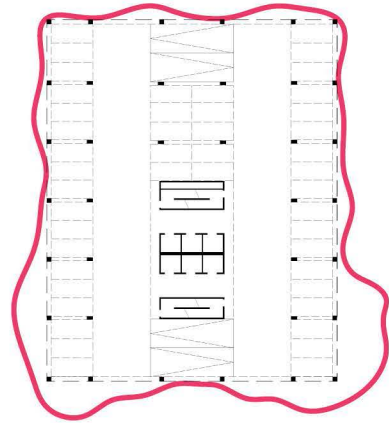
In the end, the Soft Vertical Wrapper is a formal idea, which explores the loosening of a vertical envelope to engage perception, obscuring and deforming a recognizable and stable object. Defining the rules of draped and droopy defines a system and the parameters that can be deployed in a different context.

> Figure 39-1. Partial view of oblique plan drawing.

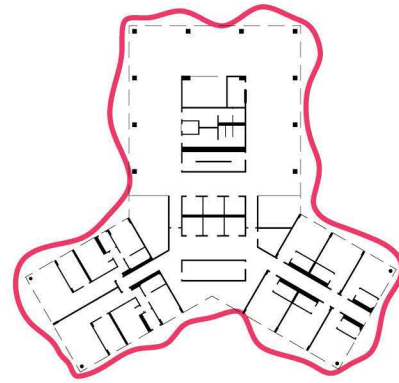


Appendix

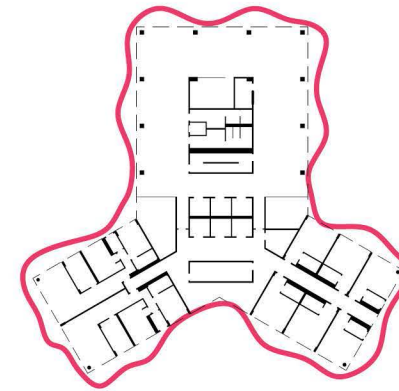
Drawings and Images



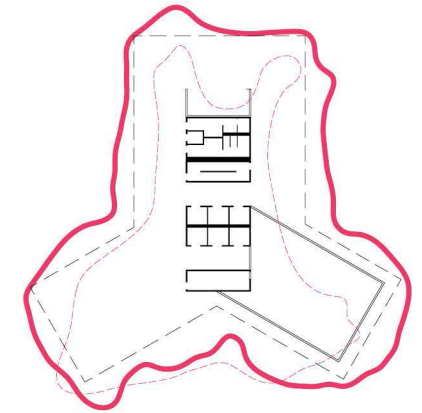
L6 - Parking



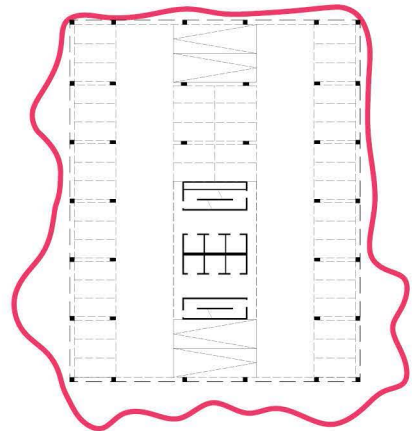
L14



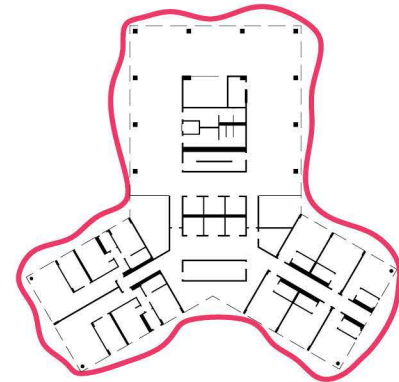
L22



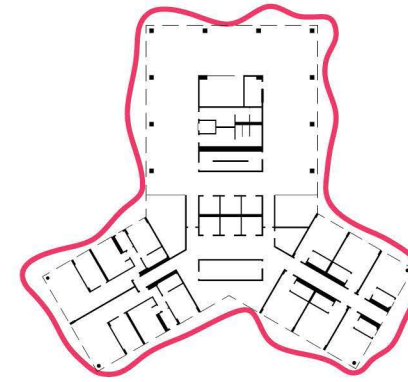
30 - Restaurant/Roof Deck



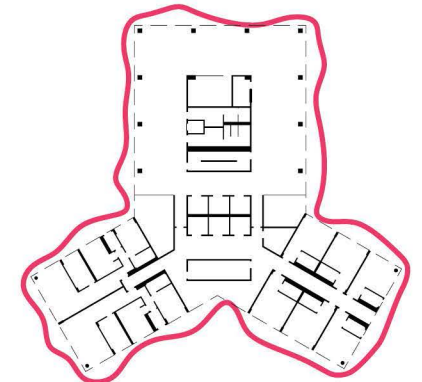
L2 - Parking



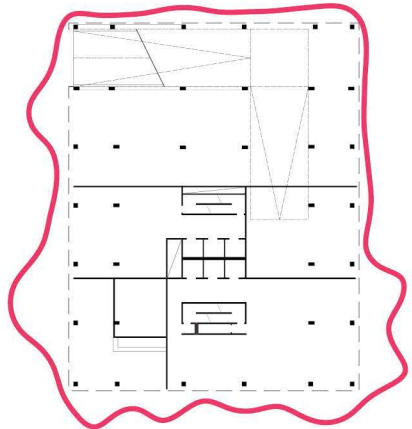
L10 - Typical Plan



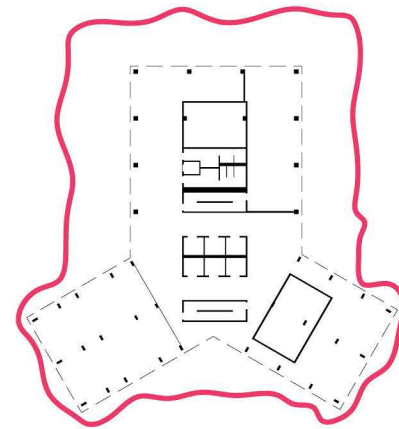
L18



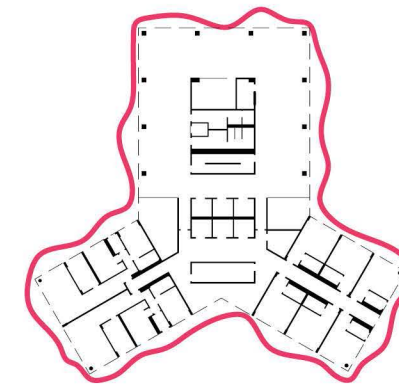
26



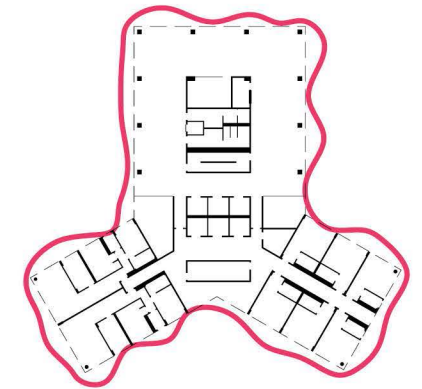
L1 - Lobby/Retail



L8 - Amenities



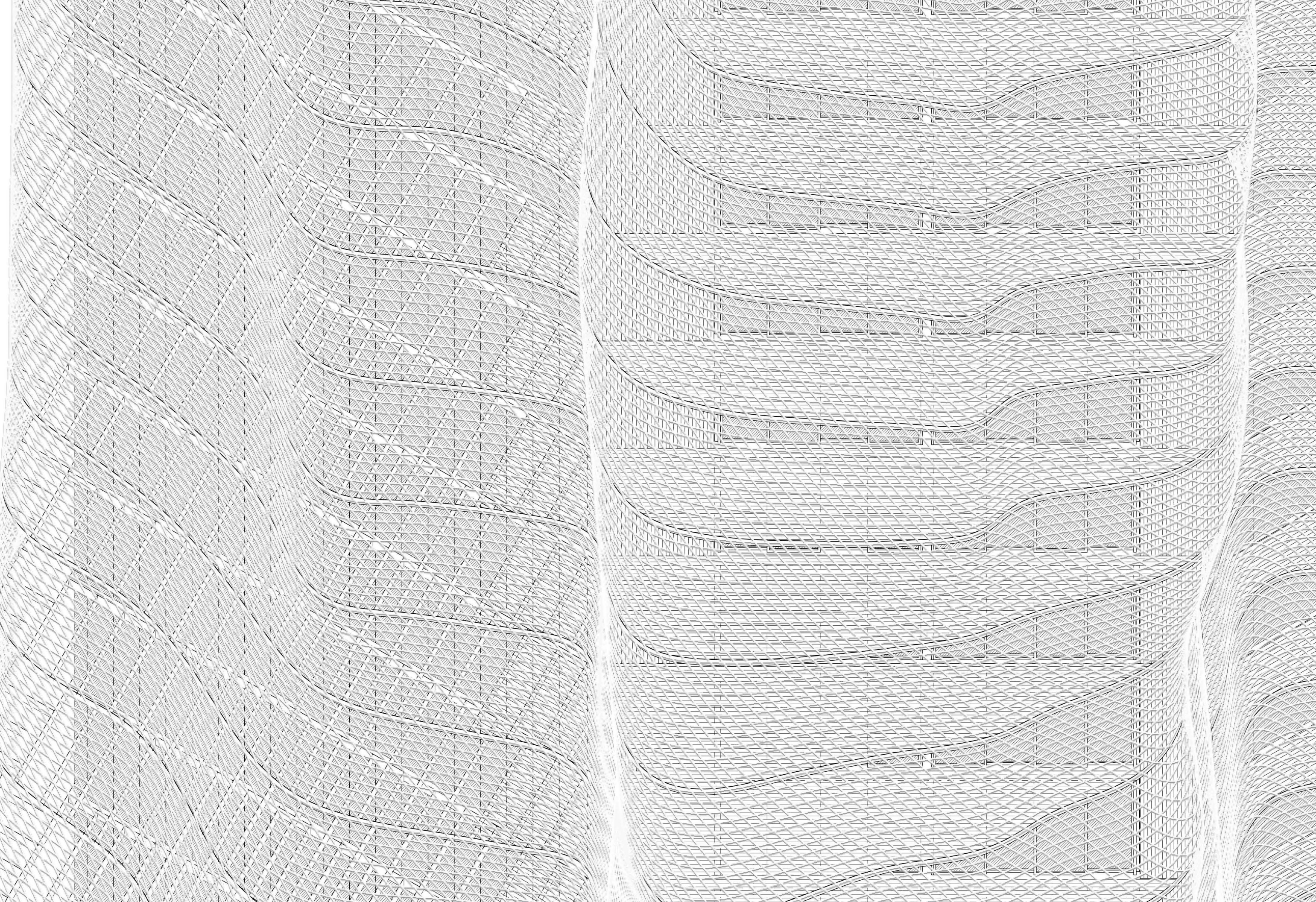
L6



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Figure 40. Floor Plans

Figure 39-2. Partial view of plan oblique.



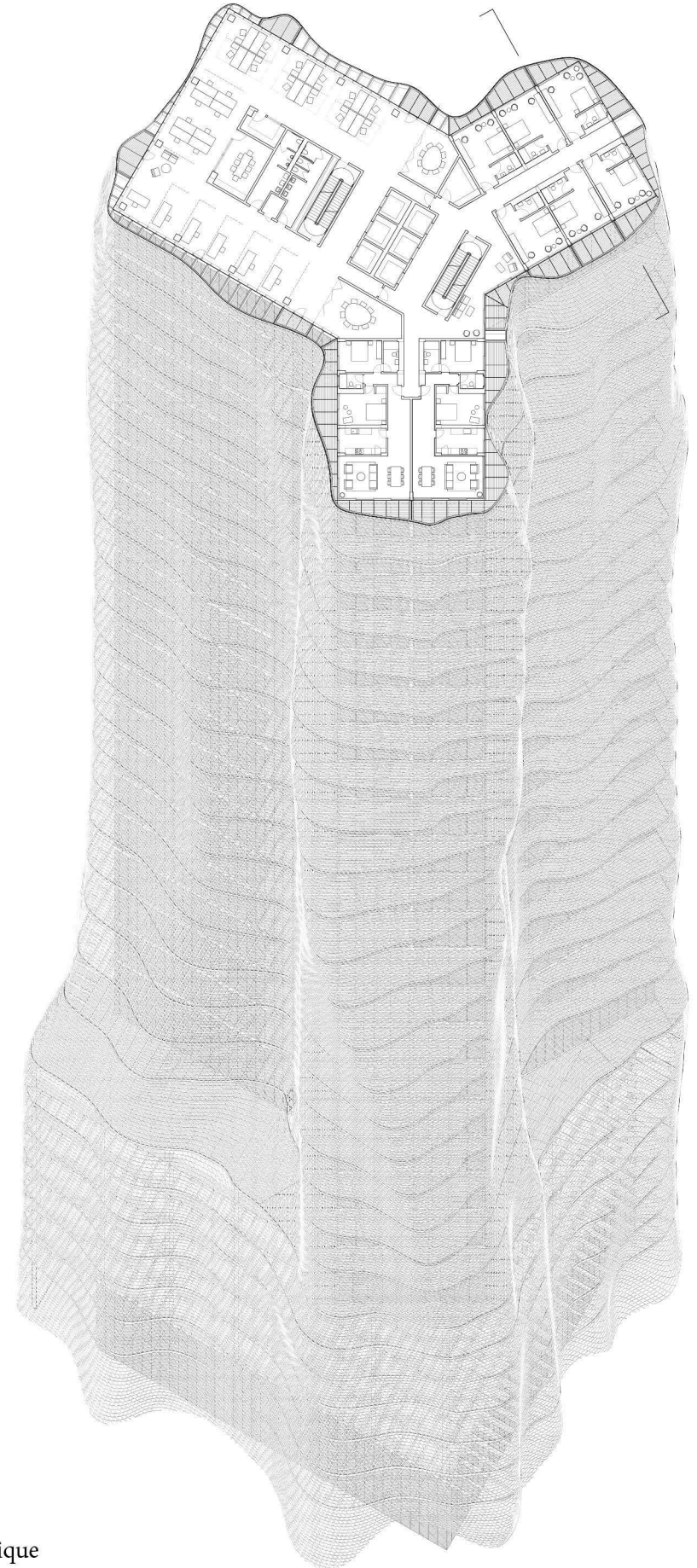


Figure 39-3. Plan Oblique

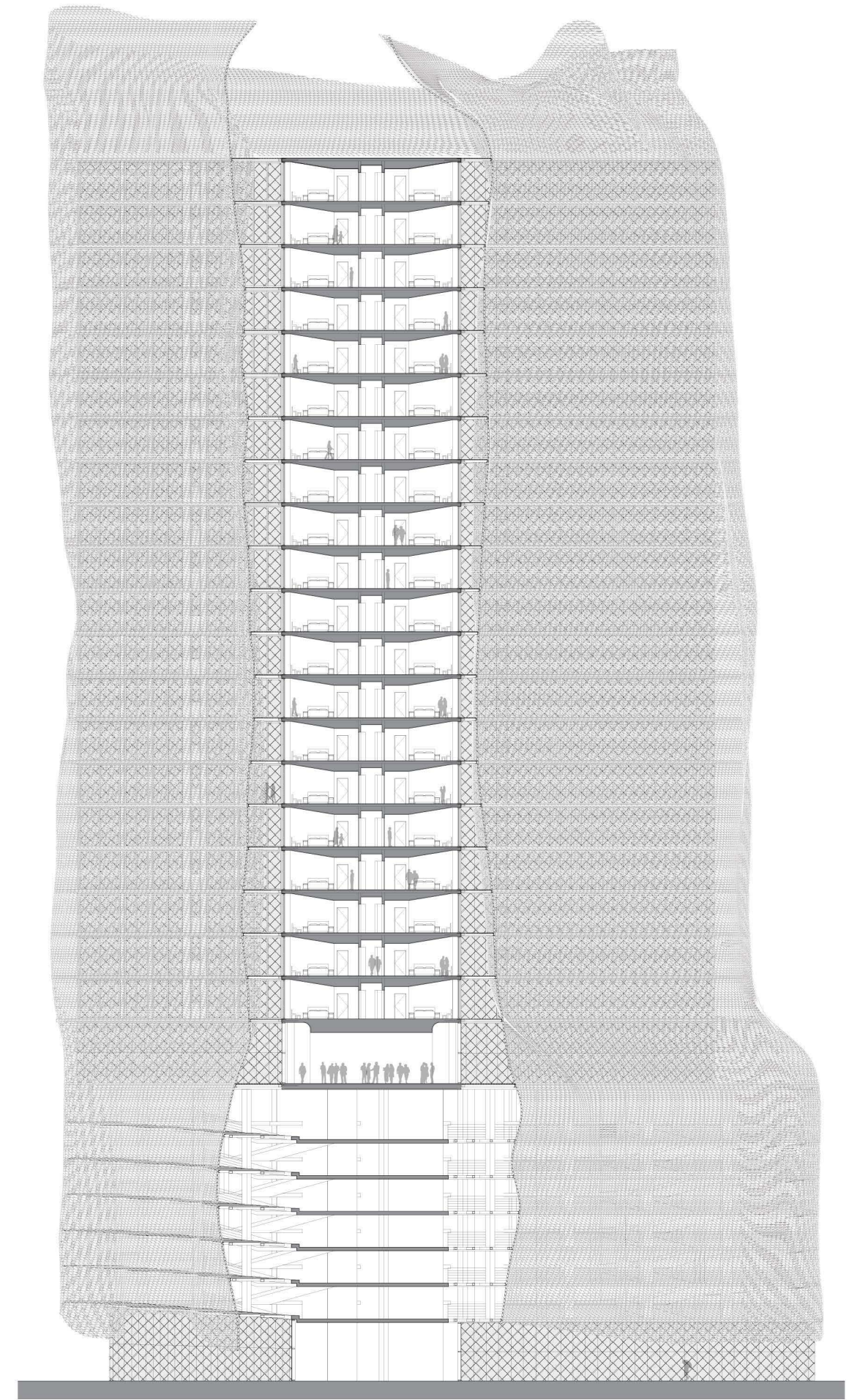


Figure 41-1. Overall Section

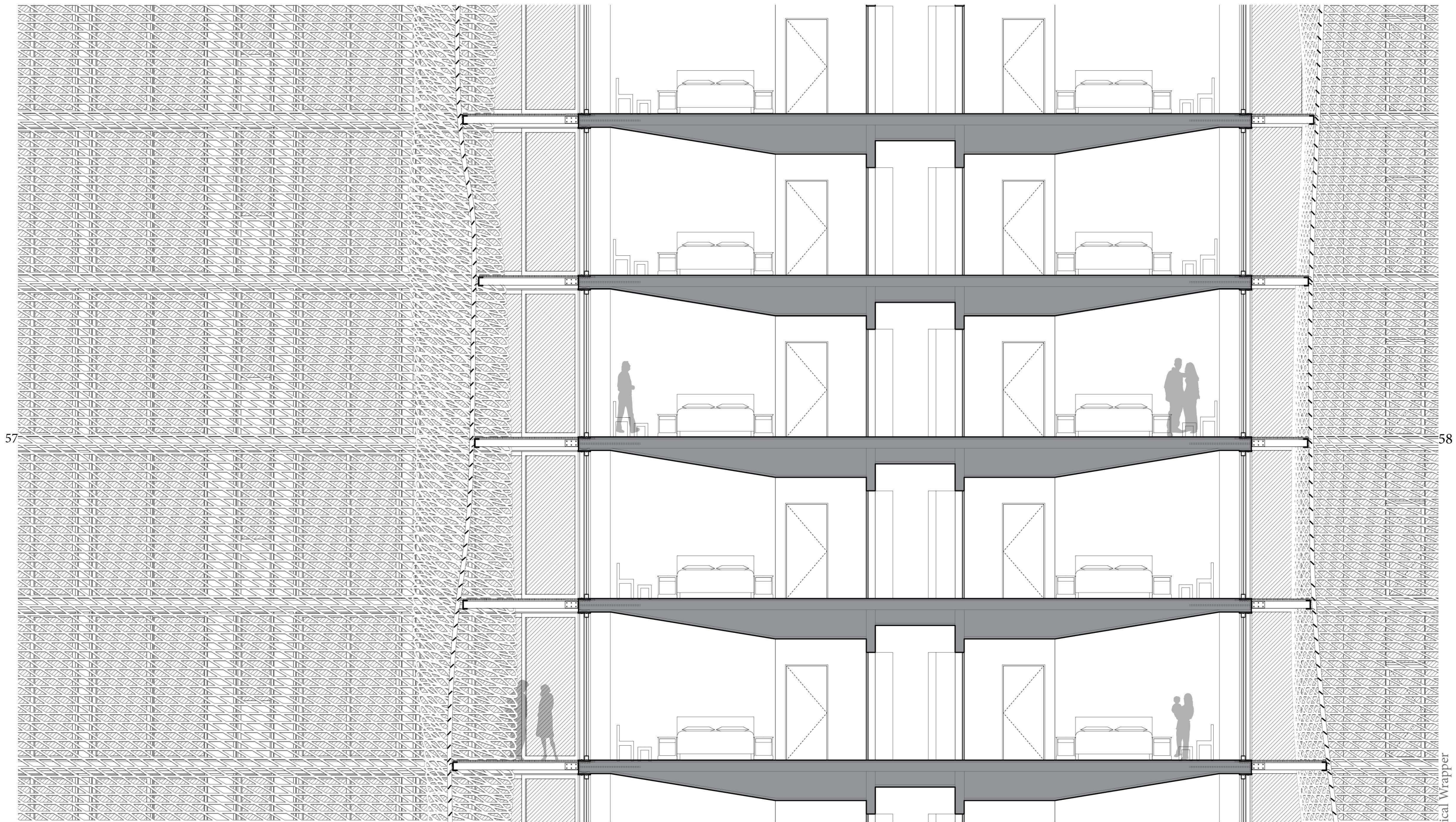
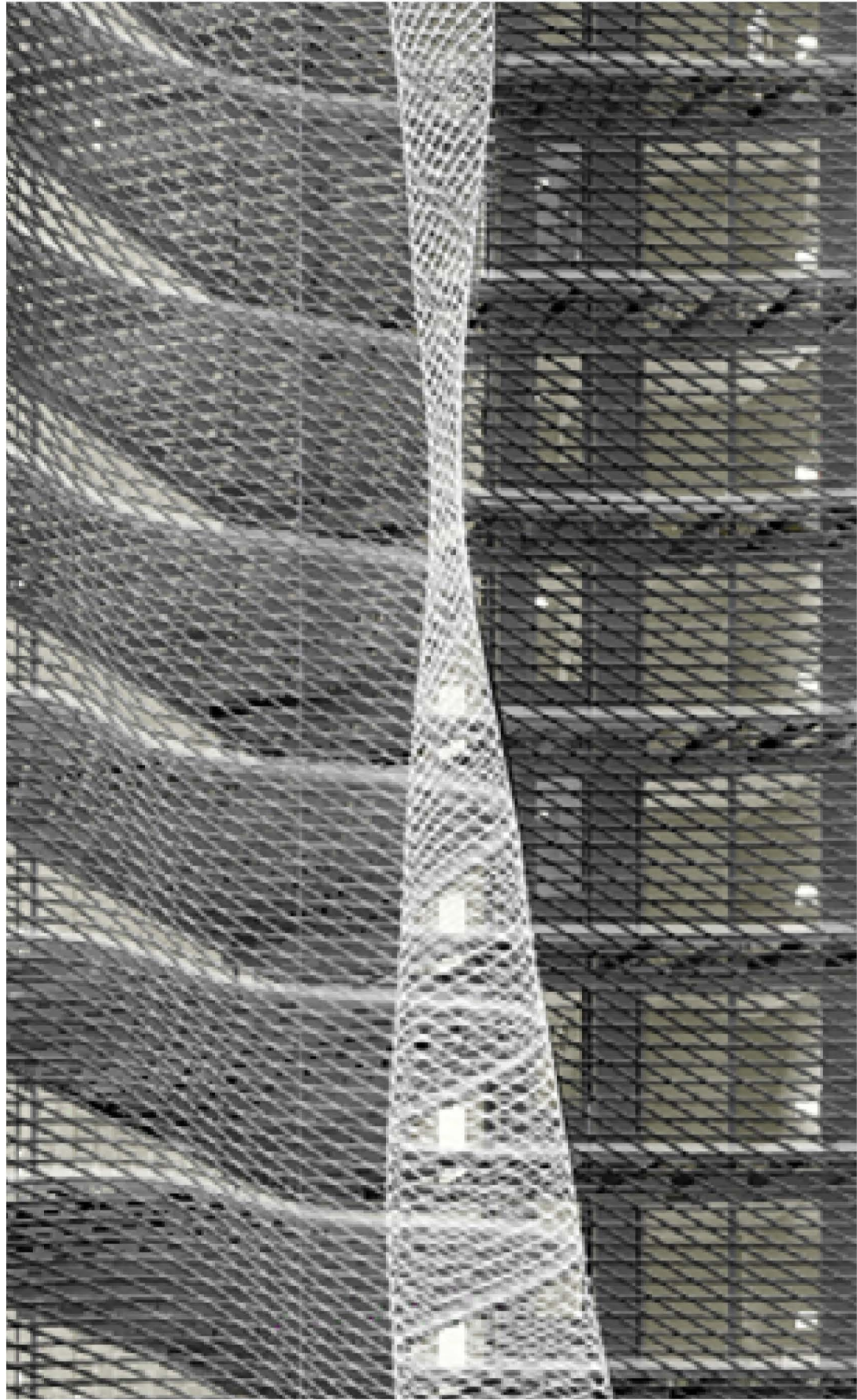


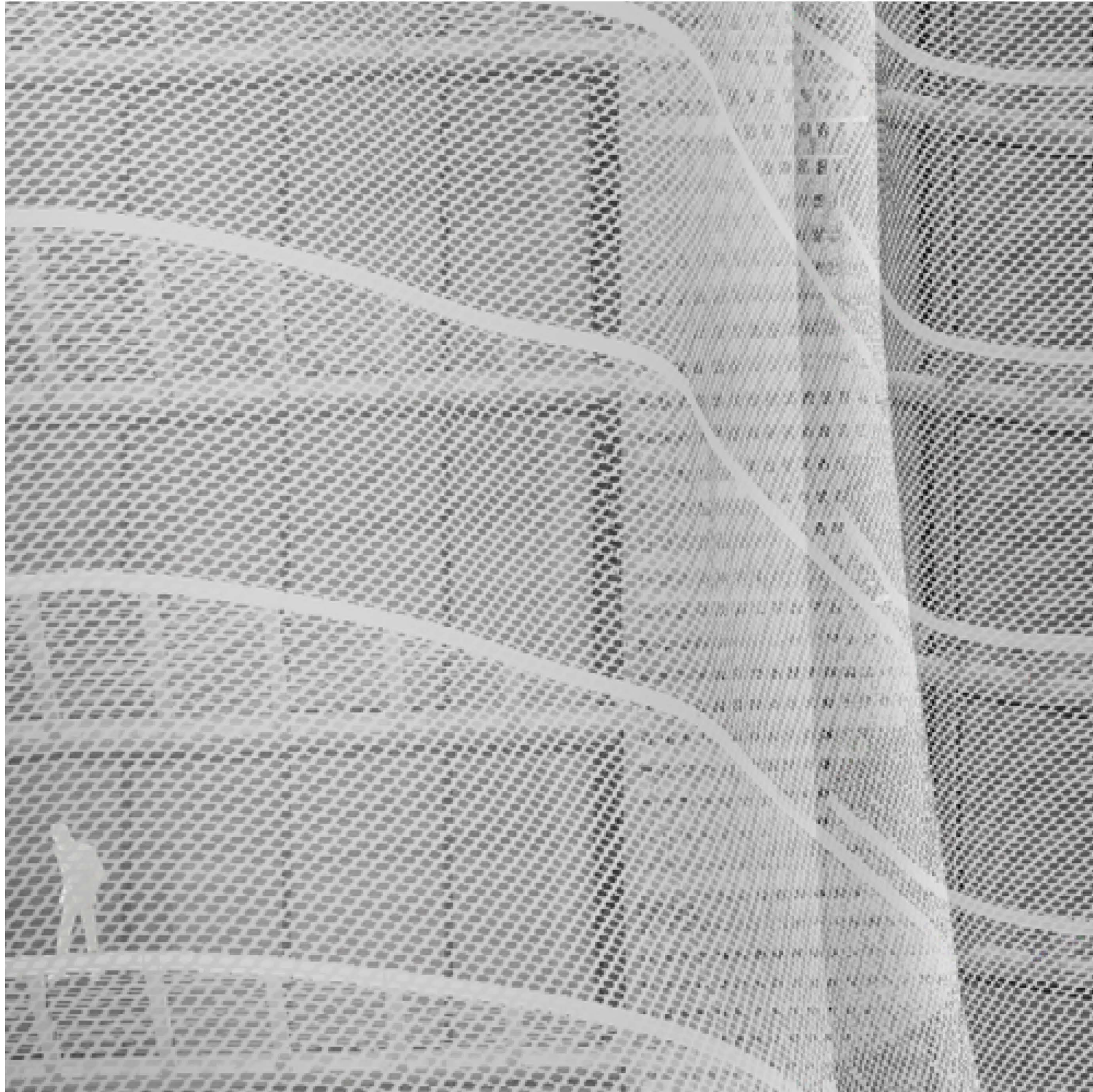
Figure 41-2. Detail of overall section (14th through 18th floors shown)



^ Figure 42-2. Night view detail

> Figure 42-1. Night view from Interstate 45 highway





^ Figure 43-2. Day view detail



> Figure 43-1. Day view from west
(Bagby St and Pierce St)

Figure 44. Close-up view of office wing looking north towards downtown

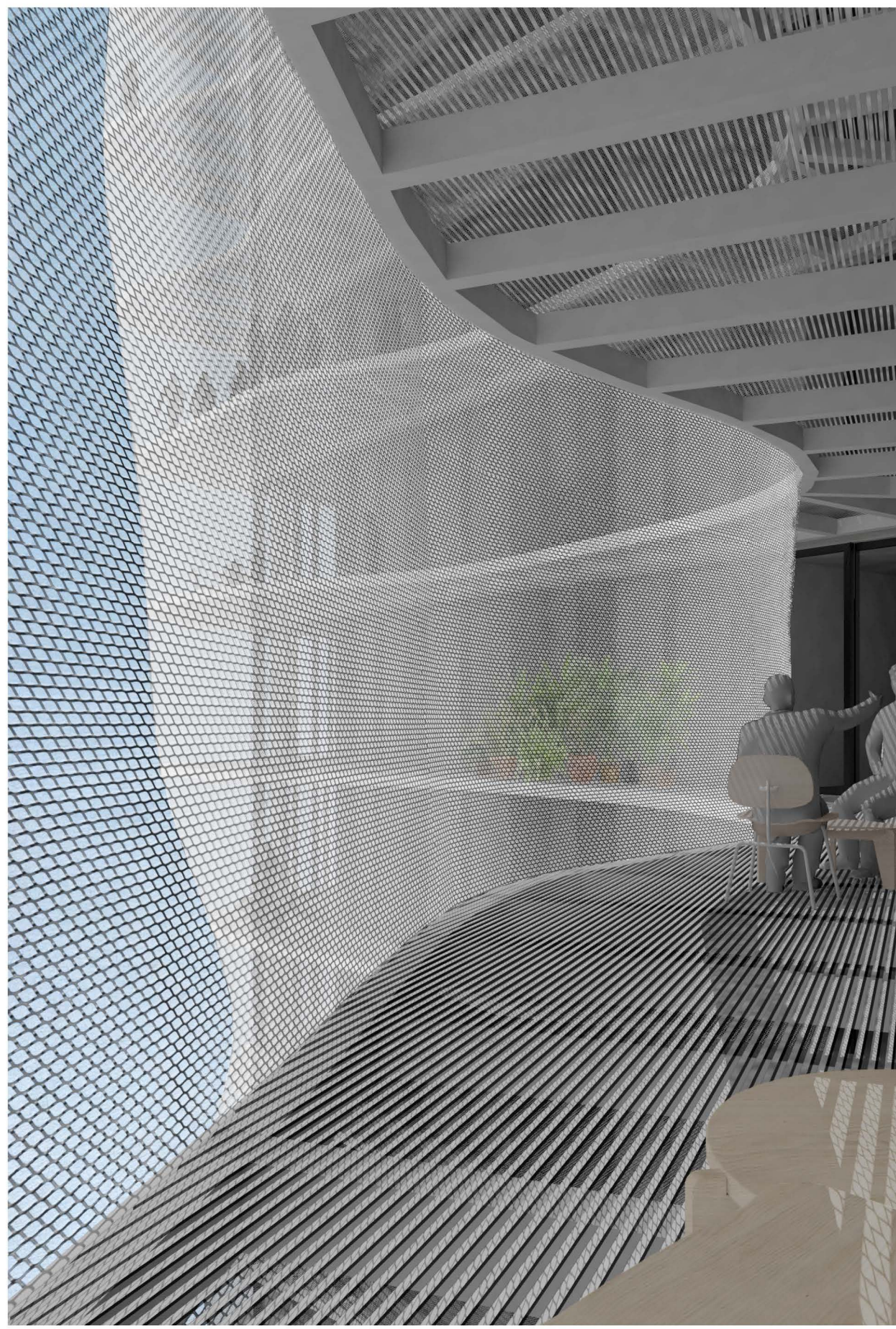
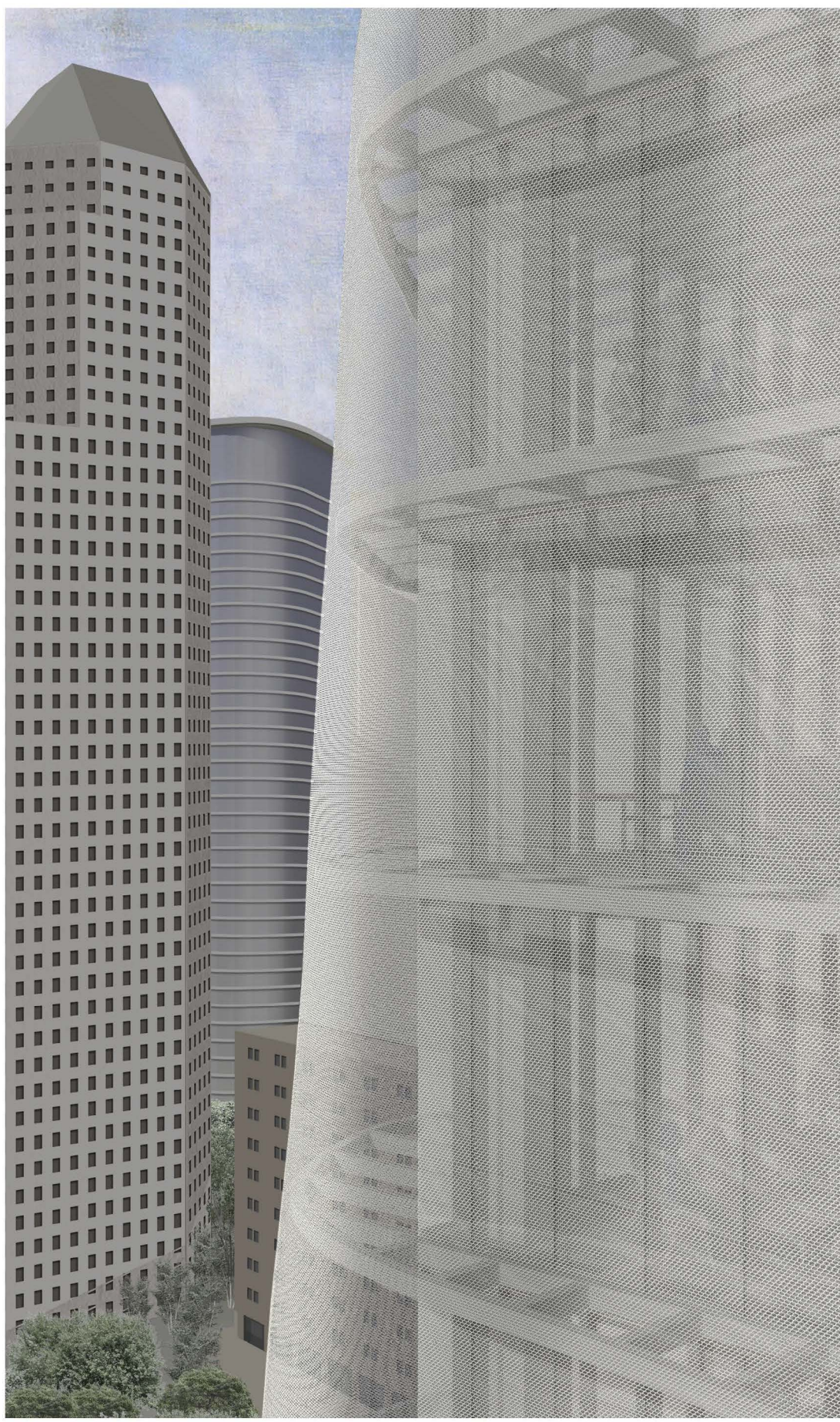


Figure 45. Interior view of hotel balcony looking towards residential wing

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